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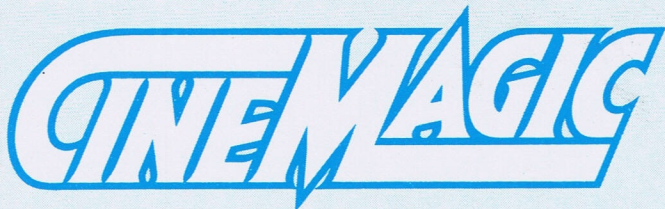
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Sept. 1979 #13

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ON THE COVER: Could genetic engineering eventually lead to laboratory-modified humans? The model is actress Paulette Sanders; the scene was staged and photographed by the inimitable Michael Sullivan. Story begins on page 20.

ON THE CONTENTS PAGE: A classic spacescape entitled "Beyond Andromeda," by this issue's Gallery artist Jim Thompson. More on page 35.

Output

Doorways and Blasphemy

During the relatively short history of this magazine we have featured interviews with many of the great science fiction authors: Arthur C. Clarke, Frederik Pohl, Larry Niven, Ray Bradbury, William F. Nolan, A. E. Van Vogt, Jerry Pournelle, Robert Silverberg and Harlan Ellison, among others. These were not little one-page chats; they were in-depth discussions complete with photos and illustrations.

In addition, each issue features reviews of new SF books and frequent articles by writers like Jesco Von Puttkamer, Ursula K. LeGuin, Gerard K. O'Neill and our own David Houston.

Perhaps most exciting, our Tomorrow department features an original article by one of the outstanding visionaries of our world—such as these impressive literary names: Isaac Asimov, Norman Spinrad, Ben Bova, Roger Zelazny, Alvin Toffler, Ted White, Charles Sheffield, Robert Anton Wilson, and this issue's author, Brian Aldiss.

The point is simple: this magazine offers doorways into the minds of science fiction writers. We do not include short stories since there are too many other good sources, but FUTURE LIFE is nevertheless one of the most important showcases in the field of science fiction literature.

* * *

Have you ever found yourself busy with so many things to do that you cried out in frustration, "I can only do so much—I just have *two hands!*" The day may arrive when science multiplies your manual capacity.

Have you ever wanted straight hair instead of curly? Blond instead of brunette? Maybe twice as much of *any* kind of hair? Up to now, the only solutions have been engineered from the *outside*—cosmetic—but future science may approach these problems from the *inside*, and the solutions will be *real*.

The cover story in this issue explores the fascinating field of genetic engineering—a field that barely exists today. In fact, up until this century, tampering with genes would have been considered monstrous.

The church has never exactly cheered on the progress of science. Usually the church has warned that laboratory experiments are "going where Man wasn't meant to go," or "tampering with divine order," or simply "not being content with the world as God presented it to us."

If I were to answer these objections the way I'd like to, it would require several pages—which I don't have. But it is interesting to note that the objections become loudest as science approaches the human body—the "temple of the soul." Biological experimentations are, according to traditional religionists, the most blasphemous of all.

There is some valid basis for this feeling: Whereas every other kind of experiment can be conducted behind protections, with safeguards that contain the uncertain results, when the human organism is itself the location of the experiment, it is almost certain to carry the results—if it survives at all.

Eventually science *must* understand and control the functions of the body if medicine is to wipe out disease and find sure methods of cure and repair. In the process, biological experimentations will turn up ways to improve on the work that evolution did. The field of genetic engineering will blossom into a mature, important science, and the human race will enjoy options and advances that, up to now, have been thought of as pure fiction.

This is a perfect article for FUTURE LIFE since it is an example of the way in which science fiction is beginning to blend into science fact. As this happens, humanity takes another giant leap forward—thanks to the scientists who are not intimidated by the Almighty's alleged desire for biological status quo.

Kerry O'Quinn/Publisher

P.S. The continuation of last issue's Output column, "The Incredible Shrinking Computer," can be found in this issue on page 52.

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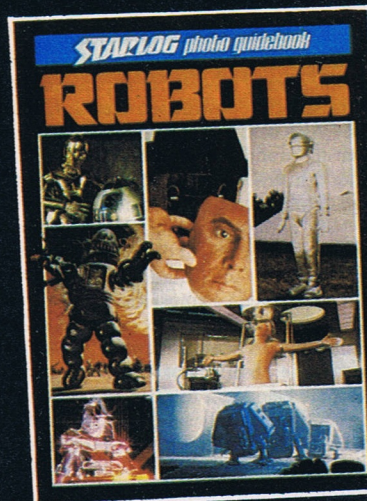
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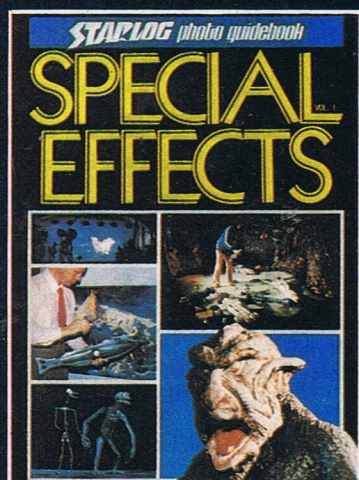
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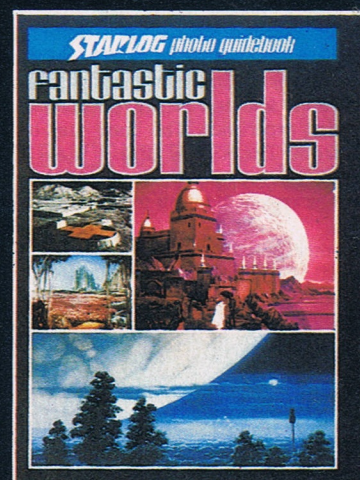
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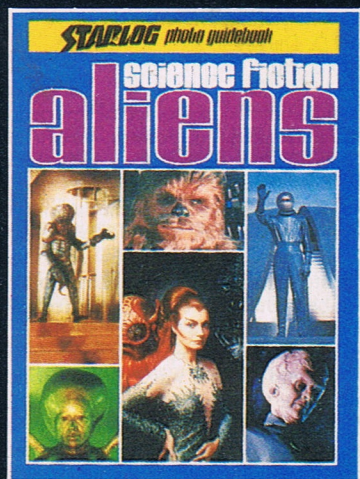
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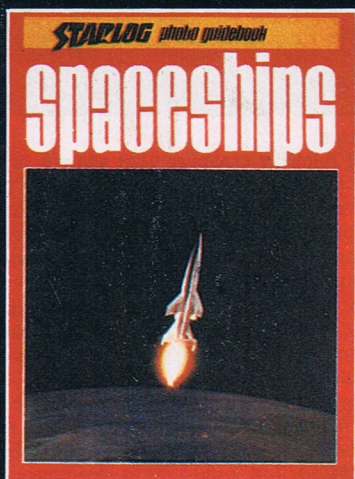
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THE TMI SYNDROME

...I would like to congratulate you on your editorial on the Three Mile Island incident in FUTURE LIFE #11.

It was far and away the most sensible analysis of the situation I have seen, and that includes my own.

Isaac Asimov
New York, NY

... Publisher Kerry O'Quinn's Output article in FUTURE LIFE #11 dealing with the nuclear controversy was excellent. I'm glad to see that a few people are trying to see the problem from a rational point of view. It may interest your readers to know that a book entitled *The Health Hazards of Not Going Nuclear* has been written by Dr. Petr Beckmann, professor of electrical engineering at the University of Colorado. Dr. Beckmann compares the risks of nuclear power with those of coal, oil, solar and other energy sources. It's an eye-opening experience. The book may be obtained from The Golem Press, Box 1342, Boulder, CO 80306, for \$5.95 paperback. It's a "must" for anyone desiring to hear our side of the issue.

W. Homer Ballard Jr.
Colonial Heights, VA



... Your feeble attempt at a think piece on nuclear power plants was so utterly wrong-headed it is difficult to select a place to begin a correction. Thankfully, it was sufficiently rambling and incoherent as to guarantee few readers could work up the motivation to digest it all.

Since yours is purportedly a magazine devoted to the future, I'll try to focus upon the more short-sighted assertions in your editorial.

Your contention that "the legitimate objections (to nuclear reactors) boil down to two problems: safety and waste disposal" rather casually dismissed two questions that are very reasonable indeed. First, are nuclear reactors necessary at all? This country wastes more energy than any other society on Earth. Conservation and speedy development of solar power could make nuclear power plants pointless. Nuclear economics con-

stitute a fourth "legitimate objection." Time and time again, the highly-touted "savings" of atomic energy have become phantom, as multimillion dollar construction overruns, repair costs, the costs associated with repeated shutdowns, soaring uranium prices, and other hidden costs and deliberate economic distortions have sent utility bills through the ceiling.

Next is the staggeringly dense statement that the Three Mile Island disaster "didn't result in a solitary case of radiation injury." My God, O'Quinn, even you must know that the effects of all but the most intense radiation take years, sometimes decades, to manifest themselves. Even today, the observers of "safe" open-air nuclear tests are being sent to early graves. And by now, of course, you've read of HEW Secretary Califano's testimony that research indicates the TMI accident may eventually result in as many as ten additional cancer deaths.

The lesson of TMI was not the cheery conclusion that Pennsylvania survived an incident where "everything that could go wrong did," as you offered, but instead that there are accidents for which the nuclear industry simply is not prepared. Whether the next unexpected, unanticipated accident will give engineers enough time to prevent widespread death is a question that your naive faith in science and technology just doesn't answer. You say the knowledge from a nuclear accident can be applied to future improvements. True, but suppose the price of that knowledge is the destruction of a major population center?

Your analogy of anti-nuclear arguments to a call for the end of flight is a pathetic sophistry. It may sound crass, but the worst possible air disaster is miniscule compared to the number of persons who would be killed and the economic havoc that would be produced by a nuclear plant

meltdown.

And finally, I challenge your analysis of the film *China Syndrome*, which you stated "projected evil motivations on the part of nuclear plant officials." Not evil, O'Quinn, but *greedy*. Nuclear plant operators and constructors are in the same business as ITT, chewing gum companies and FUTURE LIFE magazine: making money. Their approach to the problems of safety and the need for nuclear power are necessarily motivated by profit.

I regret that your lettercol can't provide the space required for a detailed rebuttal of your thoughtless, harmful editorial. For your readers' sakes, I hope you'll allow me to recommend for further reading the books *Unacceptable Risk: The Nuclear Power Controversy* by McKinley C. Olson, *The Poverty of Power* by Barry Com-

moner, *We Almost Lost Detroit* by John Fuller, and *The Menace of Atomic Energy* by John Abbotts and Ralph Nader.

And the next time you opine on matters more complex than *Star Trek*, Mr. O'Quinn, I sincerely hope you conduct more research than you did with nuclear power.

Alan B. Armstrong
Midland, MI

... I'm writing to congratulate you on your Output in FUTURE LIFE #11. Yours is the first commentary I've seen that expressed appreciation for the courage and expertise of the men who tamed the wayward reactor. You point out, quite correctly, that this accident, serious as it is, did little, if any, harm to the public. To end nuclear development because of this development at TMI does border on "fanatic irrationalism." Unfortunately, anti-nuclear activists promote this behavior for their own political ends.

The nuclear debate is an unfortunate offspring of the '60s anti-technology movement, which caused the abandonment of our SST project as well as other worthwhile projects. If these people do manage to throttle the expansion of nuclear energy (both fission and fusion), I believe we'll be seeing a great deal of trouble before the next decade is out.

T.R. Clute
Seal Beach, CA

... The fundamental question is not, as you indicate, a struggle between people who want to master the forces of nature and those who do not want to try. The real issue, like most issues in the U.S., is money. The future of nuclear power depends on making an equitable balance between profit and risk to human lives. I, too, want to work toward a more comfortable future for our world, but profit and progress are not the same. American needs energy, but before we build more nuclear plants the positive and negative aspects of nuclear power must be carefully examined.

I am also thankful for the efforts of the workers at Three Mile Island who helped to avert a potential meltdown. But I'm also sorry for them. It was first estimated that they received as much radiation in one week as they would normally absorb in a year. However, that estimate was wrong; recent reports indicate that they received *twice* that amount. How this will affect them and their children, no one knows.

Michael D. Dargay
Royal Oak, MI

... We should not and cannot let the few people known as anti-nuclear demonstrators run our lives. These people are bent on destroying nuclear power off this planet.

People make a royal fuss about the dumping of nuclear waste and there are a lot of alternatives to be found if one used his brain. If we were to shoot the waste into space then we would have nothing to worry about. Jupiter would be a perfect spot because there is nothing to contaminate there. If we were to shoot it into deep space some people say that we could send the waste to another race and contaminate their world. The chances of this are very, very thin because celestial bodies are very far apart and chances of the waste crashing on one of these is at least one in a billion. This could be even greater if the fuel was shot at a speed that is very slow; this would make it take eons to get anywhere and if there was a safe way to

dispose of the cannisters we could fly out at light speed and pick them up.

The reactions of the public to nuclear power is nauseating. The demonstration on May 6th in Washington, D.C. was retarded. Jane Fonda's support is obviously part of the publicity for her movie. I can't believe that she would be against it. Two chants that were used were just garbage: "Hell, no, we won't glow" and "Two, four, six, eight, we don't want to radiate." This shows that people have reverted to children's rhymes to call people to their cause.

Please tell the people that nuclear energy is the only way for the future to exist. It is the only buyable plan.

Murray Wilks
Edmonton, Alb., Canada

... The main factor that the nuclear debate hinges on is risk. Risk is a common part of our lives. By being alive we accept the risk of dying at any given moment, but there comes a time when a risk is too great to take. The risks of living or dying with nuclear power (and nuclear weapons, for that matter) are unacceptable. They are unacceptable not because of the mathematics that describe the probability of an accident, but because of the reasons behind the demand for energy. Many Americans harbor the illusion that they have some God-given or constitutional right to waste energy as they wish. This is the reason why more electric plants, especially nuclear plants, must be constructed. So the final question on risk is this: Are we ready to risk thousands of lives, including those of generations yet unborn, so that the greed and self-serving desires of apathetic people can be fulfilled? Reasonable people have but a single answer: no.

Dennis Andrews
Phoenixville, PA

... You failed to list a third rational objection to nuclear power. Nuclear energy has so far (and will probably continue to do so in the future) encouraged the trend towards increasingly centralized control of power both in terms of energy and money. The type of technology required for controlled fission reactions is such that only the monopolistic utilities can afford to engage in its development. If we are ever to move towards the type of society which many of us desire then we had best look toward the models presented in *Ecotopia* or *The Game Players of Zan*.

It is perhaps true that the question of the controllability of nature by man is at the root of all the pioneering efforts of our past, but I seriously doubt it. Instead, I would argue that pioneering has resulted more often from simple curiosity and sometimes a belief that a certain endeavor will be profitable. This was fine when it meant crossing the Rockies in a covered wagon, or using a steam engine to power a factory, or putting paper over wood and attempting to fly. These and thousands of other pioneering efforts did not represent a significant physical, life-threatening hazard to tens of thousands of people or millions of acres of land. As a result the measuring sticks used to evaluate them are not appropriate for the nuclear industry.

In closing, let me add that your faith in mankind's ability to develop absolute control over the many facets of nature is admirable but perhaps a little too extreme. Man has played with fire for thousands of years and has had a good understanding of it for hundreds, yet people still die in

fires every year and this will probably continue to happen. With all of our years of experience with this elemental form of energy, we still do not have absolute control over it. There is no reason to expect that our experience with nuclear power will be any different. By all means let us continue the research into fission and fusion for we certainly need the power, or at least the knowledge such research can bring us. But for the reasons discussed above, and those alluded to in your commentary, let us cease construction of nuclear power plants and begin the slow process of dismantling our huge private nuclear industry.

J. Michael Gilbreath
Brighton, MA

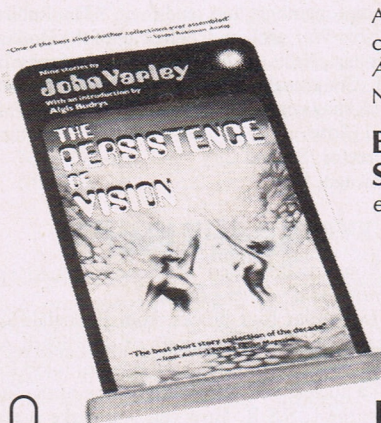
... Although the protests that arose regarding the safety of nuclear power do help point out many of the problems and inadequate "fail-safes" surrounding the production of nuclear energy, they do stretch the point to, as Mr. O'Quinn put it, "the atomic version of 'man was not meant to

fly.'" There have probably been similar outbursts of well-meaning concern regarding the discovery of fire, gun powder, dynamite and other sources of energy and/or destruction, which at the time of their discovery were the "most powerful force known to man." Besides, what other energy industry can say that they have had the same safety record over the same length of time within the same rigid safety restrictions (although not always rigidly enforced, but then, how often are rigid safety restrictions followed to the letter in any industry?) that the nuclear energy industry has dealt with.

Regarding the Databank article on Klaatu, weren't they the original artists of the hit the Carpenters had in 1977, "Calling Occupants of Interplanetary Craft"?

Danny Bates
Dallas, TX

Yes, they both wrote and recorded the song previous to the Carpenters' version.



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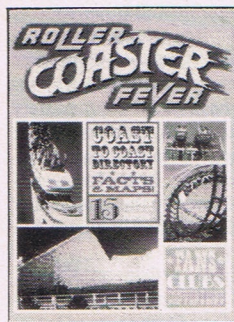
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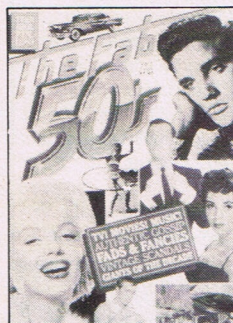


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input

...Surely in your "research" (where did you conduct this "research," in the library of Babcock & Wilcox?) you must have come across figures that paint a picture of horror, contaminated citizens and contaminated "forbidden zones" (did you know that one such zone of hundreds of square miles exists in the Soviet Urals due to an accident in a nuclear waste dump in 1957?). What happens to the 17 million people in the Indian Point Nuclear Power Station area in the event of an accident? As "unlikely" as they tell us such an event is, what will they tell us should a meltdown happen: "Guess we were wrong?"

Louis Claudio
New York, NY

BLUES A BLESSING

...I have laughed uncontrollably at the written page maybe a dozen times in my life—when the Soldier in White turns up for the second time in *Catch-22*, the description of British marksman-ship in *The Devil's Disciple* and Max Shulman's parody of *For Whom the Bell Tolls* ("Tell them how thou blewest the Bridge, Anselmo."), etc. Ed Naha did it to me again with his masterful comedic rabbit punch "The Radioactive Blues." (FUTURE LIFE #11) I've waylaid several Second City cast members and read them "The Rebirth of Tribal Warfare" and "The Fall of the Dollar"—similar effects observed. Very, very funny indeed. Congratulations on an excellent, if overpriced, magazine!

Del Close
Director, Second City
Chicago, IL

BLUES A BUST

...Your article entitled "Radioactive Blues" was the worst you've ever printed!

I live about four blocks from Barksdale Air Force Base, the headquarters of the Eighth Air Force. And I know that in the event of (God forbid!) a nuclear war, we would be one of the first hit by the U.S.S.R. How can you make fun of such a possibility? Besides, most of us would be killed anyway! I would like to know what I should do in the event I am unlucky enough to survive!

I believe that the Government should step up Civil Defense planning. The Russians are doing this. And do you know why? Because they are preparing for the *final* World War!

And I, at almost 17, have figured out when those bombs will hit. They will hit when we are celebrating one of our holidays. Since I am not a politician I can say this: the Russians will most probably attack when they are here in the U.S. talking *peace*! (Remember Pearl Harbor?)

Charles Pappa
Bossier City, LA

ALIEN ADMIRATION

...I'm sure you've received hundreds of letters praising *Alien*—the great special effects, H.R. Giger's artistic contributions, etc. In addition, I would like to say how pleased I was with the characterizations.

In everyday life, as in SF, we've advanced further technologically than sociologically. Many characters in SF (cinema) are so stereotyped as to be painful to watch.

In *Alien*, when I first beheld the crew, I wasn't prepared for anything original. Four white males,

one (token?) black male, and two females—one of them somewhat militaristic (a "tough bitch" type), the other, a bit more flighty and emotional (typical "helpless" type). Ho-hum.

Three guesses: The black guy or one of the women will get killed by the alien first. No matter what happens, the commander (Dallas; white male) will not only solve all the problems, but will personally escape unharmed. Surprise! Not only did everyone display the full range of human emotion (the men were allowed to show terror, the women, courage, etc.) but when there were only three people left near the end, the survivors were the black man and the two women!

At this point, I was resigned to the idea of the women getting killed, because if there was to be only one survivor, it would have to be a man, black or not. Again, surprise! A lone female (third-in-command Ripley) is not only the last crew-person left alive, but she defeats the alien with a display of courage and quick thinking that rivals any I've seen.

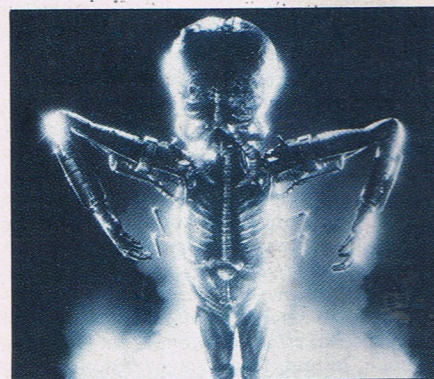
Perhaps people are growing up after all. For me, one of the great moments in *Alien* was when Ripley, alone (she thinks) in the small life-ship, begins to strip off her uniform. The theater was totally silent! No cat-calls or whistling; no winking or nudging or commenting from the audience. People were so awed by what she'd been through and were so filled with admiration for her courage as simply a brave human being that they completely forgot to think of her as a sex object!

For women, whose chief occupation in SF films (before Princess Leia) had been to scream and cling to the nearest man, it was a milestone moment.

We have indeed come a long way.

Jean Elizabeth Hutcheson
Houston, TX

ALIEN ASSEMBLY



...Who was the genius who designed/constructed the fantastic extraterrestrial on the cover of FUTURE LIFE #11?

Ken Mendell
Lachine, Que., Canada

The alien was designed, constructed and photographed by Michael Sullivan, who also created this issue's cover. For reference, Sullivan studied H.R. Giger's stunning art book, *Necronomicon*, the source of many of the alien motifs in the film, *Alien*. The 18" model was constructed from sculpee, cell-u-clay, taxidermy cat eyes, aluminum wire and tubing, springs and cannibalized parts of model kits, including an X-wing fighter, a Visible Man and Visible Horse, a Moon probe, the Battleship Missouri and an insect.

ALIEN-ATION

...In the article on the new movie *Alien* in FUTURE LIFE #11, you say that it could conceivably top *Star Wars* in box office profits. How can this be with an "R" rating? Many people (like me) will not or cannot see this movie because of its rating. I couldn't wait for the movie to get here. Now I can't see it anyway. Why is *Alien* rated R, and couldn't it be changed? I think it is stupid to put R-rated material in a movie that could well be the best SF movie ever.

Tim Lee
Vicksburg, MO

... Please, no more! After reading your article on the upcoming *Alien* movie (FUTURE LIFE #11) I was very enthused! I *had* to see this movie! Now, after seeing a commercial on *Alien*, I find that it is rated "R". And do you know how it feels to have this happen to you when you're 14?

Tom Sorlie
Ankeny, IA

NIFTY

... I think your magazine is neat-o. Like it much better than *Omni* in fact. Much less constipated, no ads for likker, cars & nicotine. More experimental & adolescent.

Khem Sietsma
New York, NY

DUNE BUDDY

... I just read that Dino De Laurentiis will produce the movie version of Frank Herbert's 1965 sci-fi best seller *Dune*, and that Herbert is penning the screenplay. Is it just idle gossip or will *Dune* really make it to the big screen?

Paul J. Elliott
Lomita, CA

No one can say for sure whether the film will make it to the big screen, but it has been optioned by Dino and is currently in pre-production.

PARADISE LOST

... I was disappointed with your total reliance on a single, heavily one-sided article in the *New West* magazine for your "Trouble in Paradise" piece (FUTURE LIFE #11), right down to the author's own catch-phrases.

In all fairness to Bob Abel, it should be pointed out that *Star Trek*'s chief problems arose from its own redundant and ambiguous authority structure. Serious ego battles, bureaucratic bungling, back-stabbing and outright name-calling became a way of life. Communication was non-existent. ASTRA's devoted, hard-working crew was relegated to second-class citizenship from the very start, and things went downhill from there.

Since few ever really understood who was responsible for what, man-hours by the zillions went to waste as power rivals refused to acknowledge each other's efforts. Abel's own added mistakes served to ice the cake, so to speak, and when Paramount looked upon Doug Trumbull as their messiah, it was hoped a final quick-cut exorcism would clear the smoke.

We shall see.

Considering all the heartache, human agony and ill-spent resources that have been poured into this film, its eventual release will seem anticlimactic. But I hope for the best.

Roscoe Polovsky
Los Angeles, CA

SPACE IS THE PLACE

... I really enjoyed Gerard O'Neill's article "How to Build a Space Colony" in FUTURE LIFE #10. It was very well done and it showed how space colonization can be done *now* if we would only make the decision to go ahead. The article was also filled with facts to prove what it was saying. I am especially glad that you put a space colony picture on the cover, which prompted me to buy the magazine. Please continue with articles on space colonies. After all, this is where our future is! We must colonize space!

Ted Apelt
Miami, FL

PERFECT PANACEA

... FUTURE LIFE #10 was excellent! I feel that your magazine, along with the L-5 Society, Dr. Gerard O'Neill and Senator Harrison Schmitt, is laying the foundation for the most massive single change of direction of destiny that we as a race will ever face: migration to space.

However, this change will not come easily. We each must do our part. Write our congresspersons at least once a month (I try to write more often), plus President Carter, the news media and other important opinion molding institutions!

The foundation for present space goals is the solar power space system. Let's champion this concept to the American public in '79 until it becomes the nation's hottest public issue. It could launch a new space era plus solve Earth's energy needs. After Three Mile Island, the American public is ready for a new energy solution.

Rory Groner
Mt. Airy, NC

HENSON HITS A NERVE

... As a regular reader/admirer of FUTURE LIFE, I have detected a jarring note in this publication—it is *pro-capitalist*! Being a total convert to the society described in Ursula Le Guin's *The Dispossessed*, I am apparently, in the eyes of Carolyn Henson at least, a "wimpy anti-wealth turkey" (FUTURE LIFE #9). Too right, Carol baby! I don't want to see a system which encourages greed, selfishness and hoarding in space. I don't want the outside hulls of my L-5 space colonies crawling with neon advertising signs or the Earth-Luna flight path boxed in with billboards. I want NASA, the representative of a democratically elected government, opening up the last frontier, not Engulf and Devour Conglomerate, property of Waldo Fitzgibbons IX, whose forefathers became rich in the lucrative fields of slavery and arms.

Chris Anderson
Edinburgh, Scotland

... I am happy you added Carolyn Henson as a columnist. She is enthusiastic and inspiring and that is the big thing at this time.

Merle Taliaferro
Kingsport, TN

FUTURE THOUGHT

... I would like to take this opportunity to commend you and your staff on your excellent magazine. I regard FUTURE LIFE as the best, for sure!

I hope that whatever idea is chosen for the Get-away Special experiment for the space shuttle, it is one that makes a respectable cash profit, because few people ridicule cash in the hand.

Brent J. Kingston
Auckland, New Zealand

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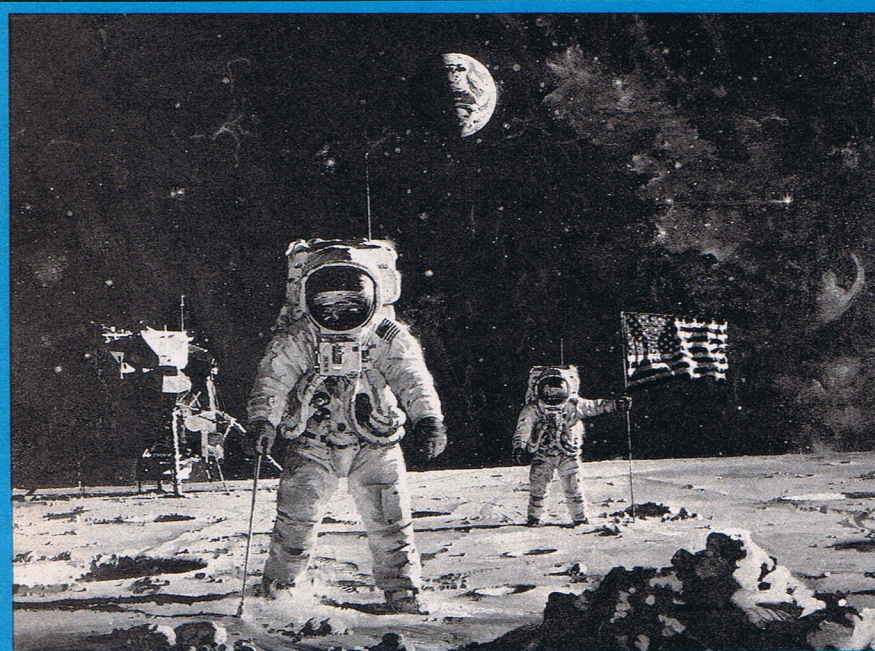
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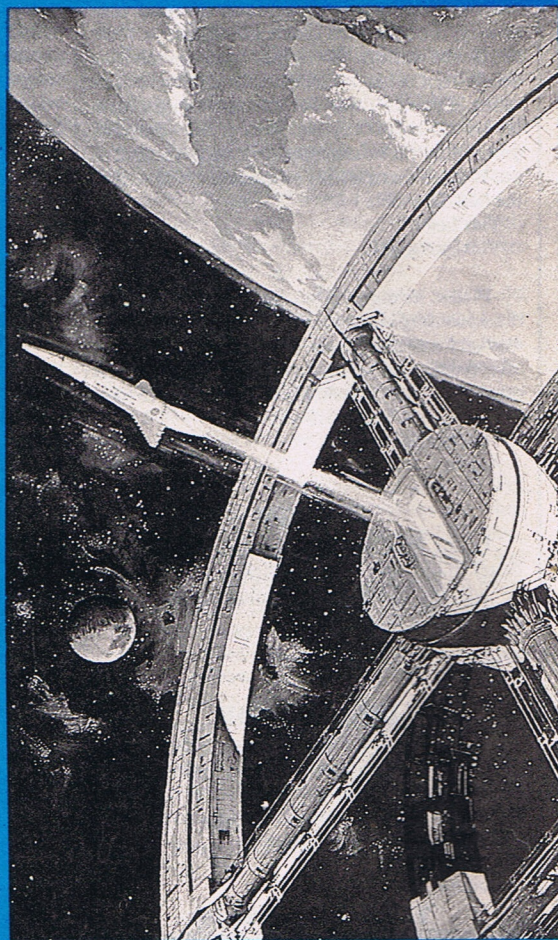
"Apollo VIII Coming Home" (NASA Collection)



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In the future Man will use his down-to-earth technology to reach deep into the awesome infinity of outer space. Robert McCall has already been there. He has a mind that spans time and space, an eye for technical detail and the hand of a great painter. His spectacular Space Station One, created for the film "2001: A Space Odyssey," has become a collector's item and a contemporary classic. Frequently commissioned by NASA to do on-the-spot paintings of America's ventures into space, McCall is always present for important launches and splashdowns. His oil paintings have gained international acclaim reproduced as U.S. Postage Stamps, one of which was the first stamp cancelled on the Moon, and another, his most recent, commemorated the historic

Apollo-Soyuz space rendezvous. McCall's work hangs in important museums, corporate offices and private collections around the world, and he has been honored in a one-man space art show at the Smithsonian Institution. There is no question about it, Bob McCall is the premier space artist of this generation. Now offered are three gallery-quality lithographs of McCall's work. These are incredibly detailed, beautifully colored paintings of Man's greatest journeys. Each 24 x 28 inch lithograph is accompanied by a descriptive statement in the artist's own words. Each lithograph can be acquired for \$10. This limited collector's edition has been authorized by the artist and FUTURE LIFE Magazine guarantees your complete satisfaction.



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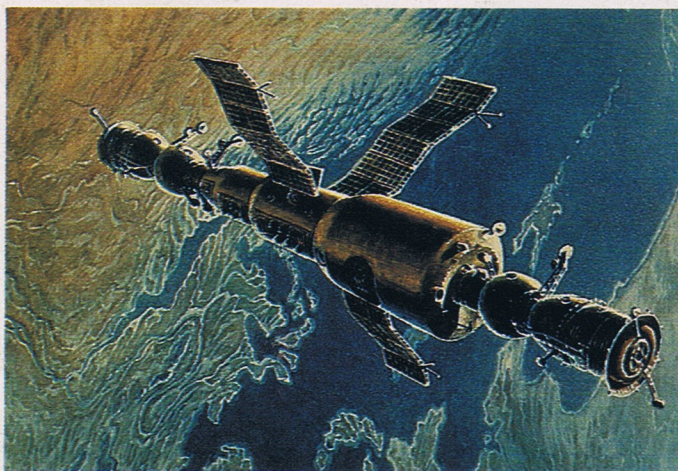
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ARTS AND (SPACE) CRAFTS

ORBITING ART CRITICS



Left, the original painting of the Aral Sea area as seen from space; right, the view corrected from orbit.

A new fusion of art and space technology has begun in the Soviet Union—the first orbiting art exhibition.

For ten years a close friend and co-worker of many cosmonauts, Moscow artist Andrei Sokolov has always sought "eyeball" accuracy in his spacescapes. Sokolov's art is of the broadest range, from the most meticulously detailed reproductions of spacecraft to the most mind-expanding surrealism of distant space. (A portfolio of Andrei Sokolov's art will be featured in FUTURE LIFE #14.) But until recently, he had not achieved the photographic accuracy he desired in his paintings of the Earth's surface.

In March of 1978, copies of Sokolov's painting of the Aral Sea area as seen from space (entitled "Over the Aral Sea"), together with one entitled "Cosmic Morning," were placed aboard the Soyuz 28 spacecraft in the care of crewmembers Gubarev and Remek. Once on board the Salyut 6 space station, the two cosmonauts compared "Over the Aral Sea" with the same area as

viewed through the Salyut porthole. They noted errors in the data and maps that Sokolov had used. They advised numerous changes to the painting.

This marked-up version was returned to Sokolov by the crew of Soyuz 30. The artist painstakingly altered the features of his painting to coincide with the actual view from space. Modifications include: changes in shadowing and coloring; details in the northern coastline, island and other off-shore land mass configurations; a reduction in the size of the Aral Sea itself relative to the size of the space station in the foreground; greater detail in hills and valleys at lower left; softer surface features; and the addition of scattered clouds.

Given the degree of success realized with these two works corrected in space, it would not be overly optimistic to anticipate the repeated use of this technique for Earth portraiture in the near future. This use of space flight could bring art and technology into a new synchronization.

—Roger Guisinger

TUBULAR SF

ABC READIES CLARKE'S "CHILDHOOD'S END"

Universal Pictures and ABC-TV are jointly working on a three-hour television adaption of Arthur C. Clarke's classic tale of alien contact, *Childhood's End*. Currently slated for airing sometime in 1980, the show will recreate the literary exploits of the alien Overlords on planet Earth. The film is being produced by Phil DeGuere, who is also handling the screenwriting chores.

"This is the closest thing to real science fiction literature that has ever been attempted for film," states DeGuere. "I don't know whether that's a good thing to say, since a lot of people don't take kindly to the term 'science fiction,' but it's the truth.

"I have the first draft of the screenplay finished and I've met with the Universal Studios special effects department to discuss what's needed for the film. I suppose you could say we're in the pre-pre-

liminary stage right now. ABC, however, would like to see the finished film air as early as May of 1980. It will definitely be finished for 1980 airing, but it might not make it until November.

"This is a very unusual project for us to attempt," DeGuere explains. "It's an incredibly complex story to do for TV. I think the only other project that you could say is remotely as ambitious is Charles Fries' *Martian Chronicles*, and they had six hours to work with. So far, things are going smoothly, though. Neal Adams has done some wonderful conceptual art for us. We're also talking to Rick Baker about designing the Overlords. He'd like to do it but it's a matter of getting our time schedules together. He's working on a film right now."

While the existence of ABC's *Childhood's End* project has been (please turn to page 14)



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Interview: Fred Pohl.
The Man From Planet X.
Tomorrow: Isaac Asimov.



No. 2—

The Truth Behind Cosmos 954.
Interview: Arthur C. Clarke.
Tomorrow: Norman Spinrad.



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The SF Films of Jules Verne. Tomorrow: Fred Pohl.



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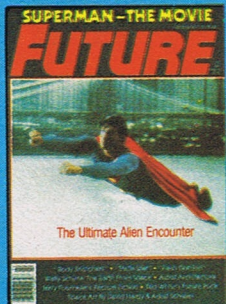
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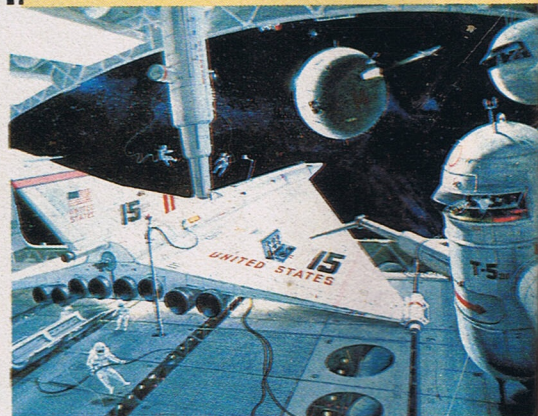
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The Space Art Club

The introduction of the Space Art Club to the readers of STARLOG/FUTURE LIFE marked a historic event. Never before was such an offering available; a series of limited-edition space art prints at a price most everyone could afford. Charter members have written expounding their satisfaction, but the original deadline prevented would-be members from joining at a savings price. Now, we're pleased to announce that you, too, can have an opportunity to own and enjoy fantastic space art at bargain rates.



The Club features exclusive, limited-edition space art painted by the masters of the field: Bob McCall, Vincent DiFate, Ron Miller, Adolf Schaller, John Berkey, Luke Pesek, Don Davis, plus one mystery artist prominent in the space art field. Virtually the Hall of Fame in space art, this incredible group represents a staggering collection of artistic techniques and scientific imagination. Each print was specially commissioned by STARLOG/FUTURE LIFE and produced on high-quality, textured paper, measuring approximately 18" x 24" in size, ready for framing!

For your convenience, there are different ways in which you can order this exclusive space art. Choose from one of these opportunities: *The Complete Collection*—the entire portfolio consists of all eight space art reproductions for only \$45.00; *Mini-Series A*—comprises print #'s 1-4 representing the artwork of McCall, Miller, DiFate and Pesek for only \$25.00; *Mini-Series B*—includes print #'s 5-8, featuring the works of Berkey, Schaller, Davis, plus one mystery space art print for only \$25.00; *Individual Orders*—for those desiring prints on an individual basis, simply indicate the one(s) you want on the order form.

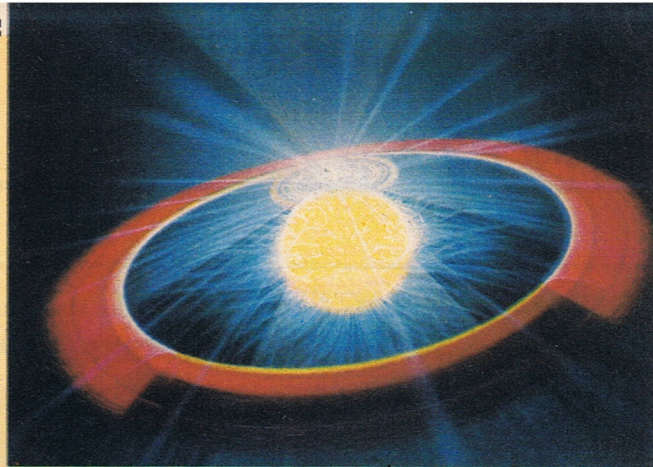
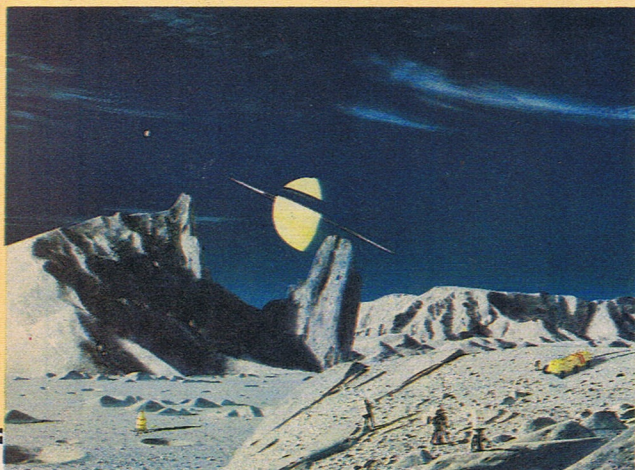
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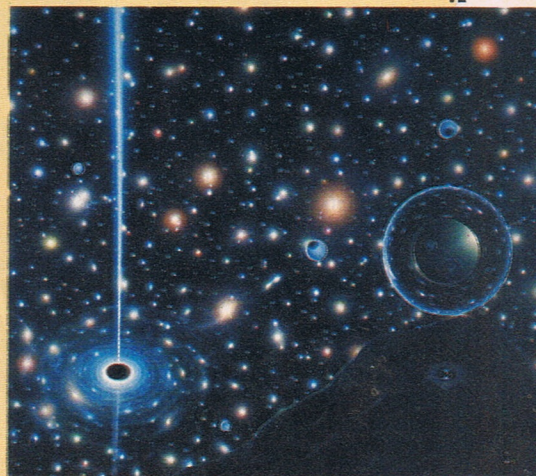


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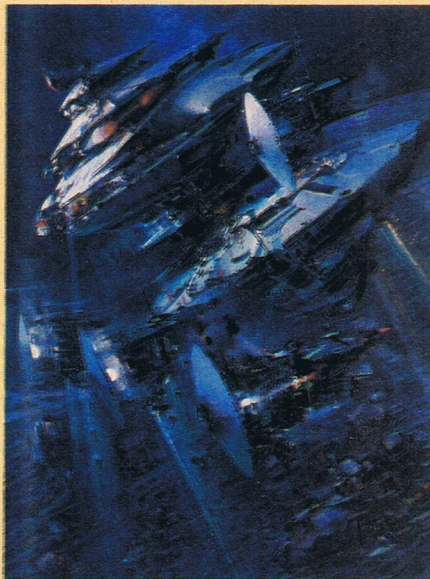
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- #1. "Space Station 2000"
by Bob McCall
- #2. "Exploring Titan"
by Ron Miller
- #3. "The Dream Fulfilled"
by Vincent DiFate
- #4. "Duststorm on Mars"
by Ludek Pesek
- #5. "Lightship Descending"
by John Berkey
- #6. "HZ Hercules Star System"
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by David Hardy

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(continued from page 11)

acknowledged for a few months now, its status has remained uncertain. "There have been a lot of rumors circulating about how unfilmable this book is," DeGuere says. "There was quite a bit of talk about legal problems between Arthur C. Clarke and Universal. Well, they have all been resolved amicably. They were resolved some six months ago. It all had to do with some confusing contracts drawn up a decade ago. I've been in constant contact with Mr. Clarke by phone, mail and cablegram. He's read the first draft of my script and he's very pleased with the results. He's sent me a few comments and helpful ideas.

"*Childhood's End* is going to be an interesting movie for a number of reasons. We're doing something very unique in planning this movie. We've gotten involved with Stanford Research Institute. They actually plan scenarios on the most probable of futures based on different data supplied, on different trends and developments in different areas in society. We gave them this premise: 'What would happen if, one fine morning, we looked up in the sky and found ourselves surrounded by spaceships?' Using that as a basis to spin from, SRI projected a possible future based on the reaction of humanity to both the Overlords and the beneficial gifts they bring: an end to war, an end to poverty, etc. We're hoping to stay close with SRI all during the development of the show so we can actually project the future as accurately as possible. What we're trying to do is not science fiction/fantasy, but *real* science fiction literature." —Ed Naha

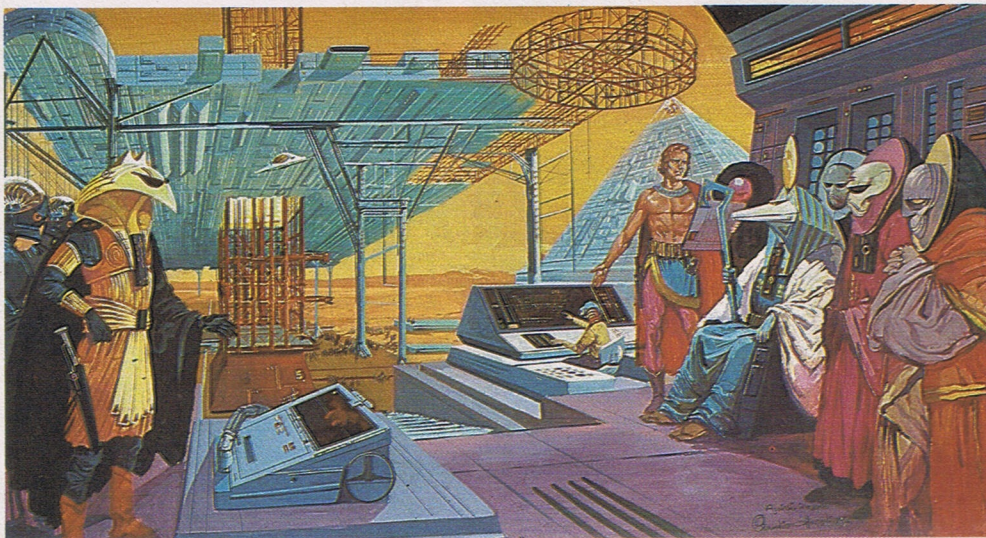
NUCLEAR DISASTER

NUKE FILMS FOR FUN AND PROFIT

Hot on the heels of *The China Syndrome*'s eerie success story is *Meltdown*, a film slated for release in 1980. Based on the best-seller *The Prometheus Crisis*, the nuclear thriller is budgeted at \$7 million and, while producer George Braunstein believes that its nuclear disaster plotline will be very much in vogue next year, he doesn't plan to be relevant in any way, shape or form. "There is no message in the film," he says proudly. "And nothing environmentalists can get their teeth into. ... We're treating it as a terror item, with lotsa special effects." Coming soon: *Godzilla Vs. The Big C*. —Gerald Morris

COMING ATTRACTIONS

SECRET SF EPIC IN PRE-PRODUCTION



A mysterious scene from an even more mysterious film project.

It is frustrating enough to stumble upon scant evidence of an important forthcoming science-fiction epic—budgeted in the multi-millions and under development at a major studio. It's even more maddening to realize that the more you discover, the less you are at liberty to discuss. It seems only fair to pass this confusion along to the readers of *FUTURE LIFE*.

The film project—which, until arrangements are finalized, must remain unnamed, undescribed, even uncaptioned—has been under development for several years. It was the brainchild of Italian artist Claudio Mazzoli, whose exceptional pre-production painting appears here. He passed on the writing chores to American writer/producer Gary Goddard.

Goddard and Mazzoli, over the past few years, have grown into a busy team with a good many other irons in the fire—some of them also in hush-hush stages. They include:

The Illumination—a rock music project involving concepts from *The Illuminatus*.

A film that transports a medieval knight to modern times, a reverse on the *Connecticut Yankee* theme.

A film working-titled *The Children of Merlin*, a sword and sorcery drama set in the present. "My best idea ever," says Goddard.

With another partner, Phil Mendez, Gary wrote *Butch Bullett and the Six-Gun Kid*—an animated film under production in Germany by Manfred Durniok.

Gary—something of a prodigy at age 26—gained experience in filmmaking during his employment at WED, a Walt Disney enterprise, and made a name for himself with his stage productions of *Jesus Christ Superstar*, which used the actors from the movie, and *Godspell*, produced as a major staging at the Huntington-Hartford theater in Los Angeles. Though he thinks of himself as a freelancer, Gary maintains an office at Paramount Pictures and presently is on call to WED as a consultant on their EPCOT (City of the Future) project.

Claudio Mazzoli left his native Milan, Italy, three years ago at age 31 and moved to Los Angeles—and into employment at WED, where he is now an art director. In Italy he worked as an artist, book illustrator, television cameraman, costume and

set designer for TV and motion pictures, and owner of his own artists' agency. Along with his family, he brought with him to America the paintings for the film project we are not talking about.

The move was traumatic; there was a language problem. "My son and my wife speak English very well now," he claims, "and I am getting better."

There is no language barrier, however, between Mazzoli and Goddard. They have found ways to communicate concerning the most complex story, design and production problems. And with their neat division of labor between the visual and the verbal, they make a very promising production team—especially for fantasy and science fiction, the realm that excites them most.

—David Houston

Italian artist Claudio Mazzoli meets in Los Angeles with young American writer/producer Gary Goddard in order to look over some sketches for their forthcoming film epic. The two are now working on several motion picture projects based on SF/fantasy themes.



PHOTOS: DAVID HOUSTON

FUTURE SHOCK

READY FOR VIET NAM II?

If the U.S. ever becomes embroiled in a Viet Nam II, shivers through an ice age, or turns to voluntary simplicity, the Department of Transportation (DOT) should be ready—or at least aware of the possibilities.

DOT has gone into the crystal ball business in a major way during the 1970s, sponsoring future studies that range from looks a few years ahead to probes into the next century. Those concentrating on the near future, the next decade, are most specific in their forecasting and recommendations. They predict smaller, lighter cars and heavier, wider, two- and three-trailer trucks will dominate the nation's highways by 1990.

Viet Nam II, a "little" ice age, and voluntary simplicity are science fictional scenarios explored in the widest ranging DOT sponsored study, *Transportation in America's Future, Potentials for the Next Half Century*. Prepared by the Stanford Research Institute, the report speculates on events up to the year 2025, focusing on four main scenarios: a disciplined, totalitarian society, a foul weather future, an "American Dream" time, and a small is better, "transformational" future. These four possible futures all have significant transportation implications, according to the study's authors.

Each scenario includes projected statistics, slice-of-life fictional vignettes and an outline of the society and its transportation needs. Some predictions: In all but a foul weather future, electric cars will dominate private transportation, especially in

urban areas; car pooling will be popular in all but an "American Dream" future, and riders may be computer matched; light bicycles with automatic transmissions, micromotors and rain protection will be numerous unless there is an ice age; car traffic will be severely restricted in central city business districts in all projected futures; road metering to insure that auto users pay a greater share of highway costs is likely in a "success" future.

The authors predict a gallon of gas will cost \$1.70 in an ice age, \$1.50 in small is better world, \$1.85 under a dictatorship, and \$1.05 in an "American Dream" future. They say the interest rate would vary from four percent in a small is better world to 12 percent in an ice age.

In less detail, the report examines several other scenarios, such as the possibility of America becoming involved in a Viet Nam II in Africa, or facing an "energy bust," both of which would lead to skyrocketing fuel costs and government rationing.

The report has been criticized, most notably by Sen. William Proxmire (D-Wis.), who gave the \$250,000 study a Golden Fleece Award, attacking it as "speculative and impractical." Proxmire said, "The report gives statistics for the year 2025 which neither the Office of Management and Budget nor the Council of Economic Advisors can predict even a year in advance."

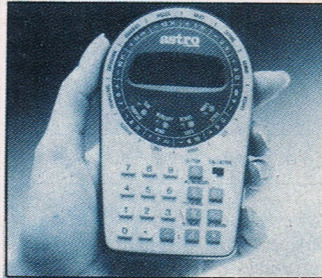
Automakers and others in the transportation industry are paying attention, however. "We're more interested in what they have in mind for next year than 2025," a Washington lobbyist for General Motors said, "but we take a close look at these things. They're going to shape policy."

—Allan Maurer

FUTURE SCHLOCK

ELECTRONIC MYSTICISM

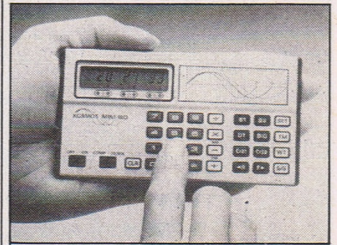
In the competition to produce the World's Most Useless Consumer Product, few have been able to top the popular "Pet Rocks" of several years ago. However, a company calling itself Kosmos International has put itself in the running by offering the American public two new handy-dandy little items: Astro, the smallest hand-held astrological computer/calculator, and Kosmos, the deluxe biorhythm computer.



Astro, an astrological computer.

Yes, ladies and gentlemen, for only \$49.95 you can now whip out your Astro computer and instantly calculate your daily horoscope without the aid of Jean Dixon. It will also provide you with information for a personality analysis for any individual and compute a personal compatibility analysis for up to 16 different combinations between two people. ("I can't go out with you, Harold, my computer says we're not compatible.")

Or, for a mere \$39.95, you can purchase Kosmos I, which doubles as a



The Mini-Bio biorhythm calculator.

biorhythm computer and 4-function calculator. Biorhythms, described by Kosmos International as "the behavioral science of life-energy rhythms," is the latest popular explanation of the ups and downs in a person's life. As the proud owner of one of these pocket calculators, you would be electronically alerted when you hit a "caution" or "mini-caution" day (in other words, when it is *not* a good idea to test out that new motorcycle). The Kosmos Mini-Bio, a more compact version now marketing for \$79.95, will not only calculate and compare your lifetime and daily biorhythm cycles, but will also function as a world clock/calendar and stopwatch. A truly versatile little item.

By the way, just in case you find yourself divorcing your astrologically compatible mate, or winning the Irish sweepstakes on one of your "crisis" days, your Kosmos pocket computers can also perform simple calculations such as addition, subtraction, multiplication and division.

—Barbara Krasnoff

PEACEFUL PRATTLE

PREVENT SPACE WAR: SIT DOWN WITH A SOVIET

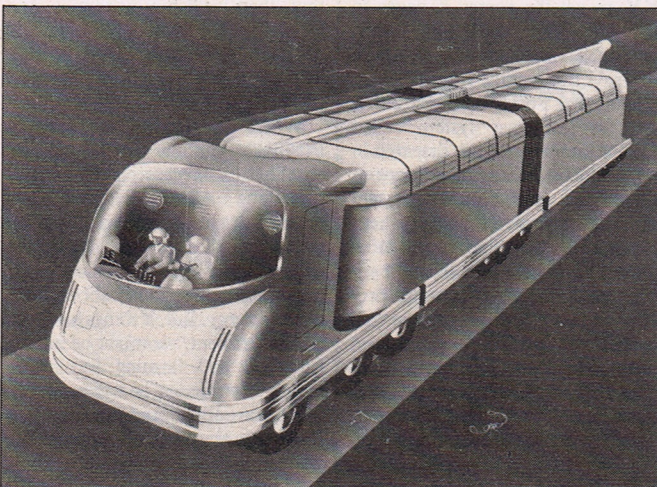
Although we are used to thinking of space exploration and exploitation almost solely in the context of the U.S. and NASA, it is good to remember that the Soviet Union is equally involved in trying to evolve a practical space program.

A chance for young adults to discuss this and other topics with their Soviet counterparts is being provided by The Forum for U.S.-Soviet Dialog; a corporation made up of independent organizations and individuals whose purpose is to contribute to the improvement of communication between the U.S. and the U.S.S.R. through personal interac-

tion. To that effect, they organize annual conferences attended by young men and women of both nations who meet to discuss various topics of interest such as science and technology, economics and trade, education, etc. These conferences become especially important when dealing with the space race because, according to the Forum's executive director, Roger Guissinger, "The directors of the 1980s and 1990s space wars are now in the classrooms of both nations; we have an opportunity now to move toward joint construction in space as opposed to mutual destruction there."

The 1980 conference will take place in the Soviet Union. For more information and applications, write The Forum for U.S.-Soviet Dialog, PO Box 19289, Washington, D.C. 20036, phone number (202) 387-8685.

—Barbara Krasnoff



This streamlined truck may be part of our highways' future, according to a study sponsored by the Dept. of Transportation.

CATASTROPHE TAKE 2

RAVAGERS OFFERS VIOLENT FUTURE



Richard Harris, Art Carney and Ann Turkel face a dismal future.

What would happen if a global catastrophe were to disrupt the normal course of events on planet Earth? Would those humans who survived be ready to face the aftermath—a nightmare of a society in which there is no law and no order? Columbia Pictures' new post-holocaust thriller, *Ravagers*, poses just that question.

The film stars Richard Harris as Falk, a sensitive survivor whose mate is murdered by the Ravagers—roaming bands of amoral scavengers who take sadistic pleasure in rape, murder and general mayhem. Falk strikes back, killing one of the Ravagers, and a deadly game of cat and mouse ensues, with Falk in the rodent role. Meeting up with straggler Ann Turkel and slightly deranged Army sergeant Art Carney who believes Falk to be his long-lost buddy, Falk finds refuge on a large Navy vessel where a small community, led by Ernest Borgnine, lives off a vast stash of food and supplies. The Ravagers find Falk and the ship,

however, and soon a scaled-down version of the war of the worlds is underway.

Directed by Richard Compton, *Ravagers* takes a dismal view of the future but offers its actors an excellent showcase in which to display their frenzied talents. Art Carney, for instance, was so good in his role that, during shooting, he was raised from the "dead." Carney was to have been "killed" while holding off a throng of Ravagers at a mansion, allowing Harris and Turkel to escape. After viewing Carney's footage, both producers of the film and the director felt that it would be a mistake to dissolve the obvious screen chemistry that existed between Carney, Harris and Turkel. They discarded his already-shot death scene and Carney was asked to perform in the rest of the picture. The script was rewritten to bring Carney back into the action. Even in the most hopeless of futures, it would seem, Hollywood still believes in life after death. —Kent Dorfman

KILLER BS

CHEAPNESS IN SPACE

If you thrilled at the flatfooted exploits of Sonny Tufts in *Cat Women of the Moon*, applauded for the cardboard giant beetle in *Queen of Outer Space* and swooned over the spear chucking mutants in *Rocketship X-M*, then Chevy Chase has a movie for you. Comedian Chase is resurrecting every mind-numbing science fiction cliché in the annals of filmdom for his upcoming production *Saturday Matinee*. Written by

Chase and former *Saturday Night Live* crony Michael O'Donoghue, *Matinee* will effectively recreate all the ingredients of a 1950s afternoon at the theater, including lampoons of travelogues, follow-the-bouncing ball sing-alongs and coming attractions. The centerpiece of the opus will be sci-fi thriller "Planet of the Cheap Special Effects"; a full-length look at celluloid inanity starring Chase. Filming is slated to start this month under the watchful eye of United Artists. The entire avalanche of nutty nostalgia is being produced by Martin Erlichman and Chevy Chase. —Ed Naha

AMBITIOUS ENTERPRISE

KEEPS ON TREKKING

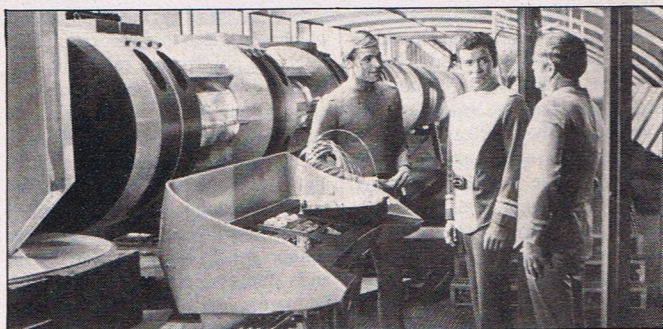
Despite rumors to the contrary, *Star Trek—The Motion Picture* will make its December 7 release date. According to the film's director, Robert Wise, all published reports that the film is running drastically behind schedule are "totally false." The film has run into its share of snags of late, most notably the well publicized debacle concerning the failure of special effects technician Robert Abel to come up with any suitable footage after nearly a half year of work. Doug Trumbull of *Close Encounters* and *Silent Running* fame has since replaced Abel, and Hollywood gossip mongers are stating that even the magical Doug won't be able to get the battered *Enterprise* off the ground by December.

"There's no truth to that rumor," says Wise, who is still re-shooting one or two key scenes on Paramount's lot. "The special effects are coming along very well. We have had some problems in this area in the past but those problems were taken care of in time for us to make our release date."

According to Wise, the scenes that are being re-shot would have had to be redone anyway, regardless of *Trek*'s special effects status. "There was one scene in particular, involving a number of astronauts suspended by wires, that I wasn't particularly pleased with. It was good, but not as good as I wanted it. I'm going back to re-shoot it in a week or so."

And so, with cameras still grinding and industry pundits gritting their teeth, *Star Trek—The Motion Picture* continues its arduous voyage to movie theaters across the country.

—Joseph Kay



The *Enterprise* is proceeding at warp speed to a December opening.

GASSING UP

POOP POWER

Where is the world going to get the energy it needs to maintain a high technology when fossil fuels run out? A biologist in Iowa says it will come from farms.

Sunnytime Foods of Des Moines, Iowa, is testing a system called POOP4 that may be the first step in making farms energy plantations as well as food producers. The system uses manure from 160,000 chickens to make methane that runs a 100-kilowatt electrical generator.

But the \$110,000 system also produces so much fertilizer that it paid for itself in two years. In addition, it meets federal environmental standards that would be costly to meet otherwise. "So, right off the top, any electricity it produces is free," says Courtney P. Allen, the geneticist who is president of Sunnytime. He predicts Iowa will produce twice as much electricity as it needs by the year 2000.

"We have a grant from the government to hook into the power grid system here, and when we do, you'll have a farm producing electricity for sale. We could make \$10,000 a year clear profit," Allen says. "If we do that, then we'll buy windmills, and whenever the wind blows, we'll be making electricity. Other farmers will have to do the same to stay competitive."

Where did they get a name like POOP4?

"The initials originally meant something," Allen says. "Poultry and odor are in there somewhere."

Despite Allen's own evident sense of humor, he says, "It's hard to get people to think seriously about farming for energy. But, if things had been a little different, we might be mining for food and farming for energy today." Petroleum, he notes, and all other naturally stored energy, came from organic plant and animal life sources.

"Farming for energy is what the future holds," he says.

—Allan Maurer

MARICULTURE

TEST TUBE OYSTERS

Test tube babies may get the headlines, but researchers at the University of Delaware College of Marine Studies are more concerned with "test tube" oysters.

Biologists there are already able to produce market size oysters and clams in the lab in less than a year, while nature takes up to three years to do the same thing. Dr. Kent Price, associate dean of the college, sees a time in the not-too-distant future when aquaculture will rival agriculture.

"I like to draw parallels between what we are doing here and man's evolution of agriculture," Price says. "Ten thousand years ago man gained subsistence by nomadic wanderings, shooting wild game and gathering berries. Despite a superficially high technology, this is analogous to the way we collect our seafood today."

Two main accomplishments by UDCMS biologists have made production of shellfish in a "managed system" possible, Price says. First,

they learned enough about algal life cycles to grow them rapidly and densely as shellfish food. Second, they have been able to grow their oysters and clams from egg to market size in a controlled environment system using acid sterilized seawater and a defined algal diet.

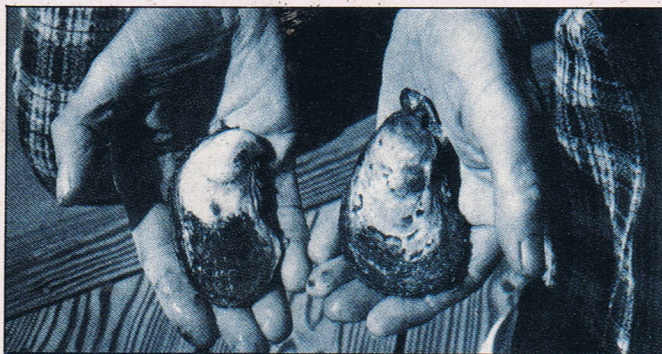
The system works so well that smaller, slower growing shellfish must be culled. "Normally oysters produce 50 to 100 million eggs, of which only two or three would survive in natural environments. In the lab, we get 95 per cent survival.

"We select for good meat quality, fast growth, and nice shell shape. Man has been doing this in agriculture for thousands of years through selective breeding. We're just beginning to do it in aquaculture," Price says.

A prototype mariculture center designed to demonstrate the feasibility of growing large numbers of shellfish in a controlled environment is underway at the college and should be complete late this year.

"Commercial aquaculture can become a reality in the near future, creating a viable food source and new bases of national wealth," Price says.

—Allan Maurer



The lab-grown oyster (right) produced twice the meat in less time.

CRAZY GLUE

NO-FAULT IDEA FOR NUKE WASTE

One of the biggest problems facing proponents of nuclear power today is how to dispose of the dangerous radioactive wastes that are the byproducts of the industry. A rather imaginative solution has been offered by the ISCDs (International Stop Continental Drift Society), a tongue-in-cheek group of "solid-earth, not-so-solid-earth, rare-earth and other scientists and tectonophiles." In the society's recent newsletter, two of the members, R.B. Cathcart and John C. Holden, have suggested that the waste be transformed into "radioactive sinks"—dense ceramic containers which would be filled with high grade

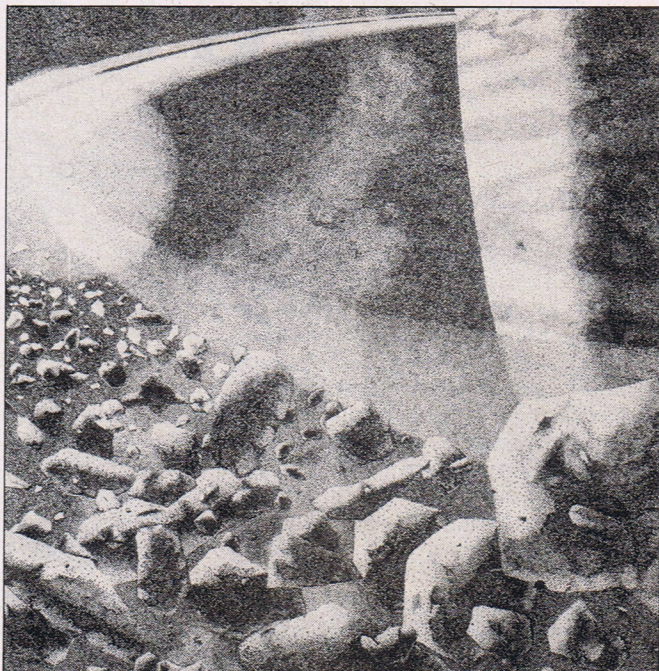
radioactive wastes. These could be dropped into such inconvenient geological trouble spots as the San Andreas fault, where the radioactive heat would "melt together" weak parts of the Earth's crust.

Of course, enormous amounts of the radioactive material would be needed to implement this scheme, much more than is available at present. Therefore, the authors suggest a massive increase in nuclear technology—thus, even should we radiate humanity off the planet, "the waste materials would be available to repair Mother Earth."

—Barbara Krasnoff

PIONEER SPIRIT

COMING SOON: SATURN'S RINGS



The view from Saturn's rings, according to astronomer Bensusen.

Astronomical artists are crossing their fingers in anticipation of the first close-up pictures of Saturn—coming soon from NASA's Ames Research Center, via the Pioneer 11 spacecraft. Launched in April 1973, the Pioneer will make its closest approach to Saturn—skirting its famous rings—on September 1. The next day it will pass near Titan, Saturn's "Earth-like" satellite. Beginning August 26, the spacecraft will return pictures of the ringed planet surpassing any previous Earth-based observations. Between then and September 8, Pioneer will take about 50 pictures—revealing the unlit side of the rings and heretofore unknown views of Saturn.

Saturn has long been the favorite subject of astronomical artists, and the Pioneer encounter will make some look like prescients and others like science fiction dreamers. Sally J. Bensusen, an astronomer with the U.S. Naval Observatory and an accomplished science fiction and space artist, is one of those with her fingers crossed.

Reproduced here is her unique Saturnian vision from the vantage point of within the rock ice rings, at a distance of about 35,000 miles from the planet surface. The artwork is titled "Veil of the Sun," and is meant to depict a sunrise seen from the rings, a view that will be closely ap-

proximated by Pioneer as it emerges from behind the planet—but just outside the rings.

Bensusen's view adheres to a basic three-ringed structure, the theory she's "going with." She explains the pen-and-ink artwork: "The outermost ring appears far in the background, separated from the two inner ones by a gap called Cassini's Division. The 'B' ring (in the foreground) might be comprised of large chunks of 'dirty ice,' some of which may be as large as 100 feet across. At a greater distance, separate chunks seem to blend together, appearing as a continuous sheet. The innermost crepe ring is so called because it appears to be so thin that it is barely visible from Earth. Here it is shown to be made of fine dust particles, which allow Saturn and the Milky Way to show through from behind. These dust particles diffuse the light from the sun in much the same way that thin ice clouds do on Earth."

Bensusen used a technique known as pointillism to do this 14" x 17" drawing, entailing 40 hours of continual dotting, placing one dot on the page at a time. Reduced to this size, the dots blend together to paint this planetary portrait in much the same way that individual elements of Saturn's rings appear to blend into a continuous sheet of ice.

—Robin Snelson

KITT PEAK

By PHILIP L. HARRISON

Ever wonder what would really go on most of the time onboard a starship like the *Enterprise*? The adventures we are so accustomed to seeing or imagining would be the exception rather than the rule. One of the ship's prime functions, aside from diplomacy, defense and aid, would be exploration and research—why else would a science officer have a station on the bridge?

Research—specifically astronomical research—would be a major objective of the crew. And in addition to studying stellar reactions, nebulae, planetary oddities and the like, the ship's navigational capabilities would be vitally dependent on galactic mapping in all ranges of the spectrum. Without astronomy, the *Enterprise* wouldn't know where it was going, how far away their objective was, what would be the best way to get there, what they could look forward to when they arrived... or whether it was even worth the time and expense to make the trip in the first place (a far cry from the ocean explorers of the late 1400s and early 1500s!).

Astronomy aboard the *Enterprise*, or any starship for that matter, would be as different from modern research as current techniques are from those during the time of Galileo. And nowhere else can you get a better appreciation for the fantastic technology of today's astronomy than at Kitt Peak National Observatory just west of Tucson, Arizona. Together with its support facilities at Tucson, Kitt Peak represents one of the largest concentrations of astronomical hardware in the world and gives an unparalleled opportunity for both graduate and undergraduate students from around the country to get "hands on" training for the discoveries of tomorrow.

The origin of the observatory complex might well have been part of a science fiction novel. The new emphasis on space exploration that arose in the mid-50s created an expanding need for astronomical research. The National Science Foundation planned to meet the challenge by constructing the first major American optical observatory since the Mount Palomar facility a quarter of a century earlier. To accomplish that, a three-year search was begun under the auspices of astronomers Aden B. Meinel and Helmut Abt.

The search was to take into account every factor from weather conditions and available summit area, to the seemingly contradictory

The "men with the long eyes" stargaze from an Arizona mountaintop.

requirements of remoteness from bright lights and availability of a nearby city large enough to have a university.

In 1955, the astronomers launched a Viking rocket from White Sands Proving Grounds in New Mexico, equipped with long-range aerial cameras. From the edge of space the cameras photographed New Mexico and its neighboring states. From these pictures Meinel and Abt added the Quinlan Mountains, just west of Tucson, to their list of 150 possible sites.

A year later the mountains had been photographed in more detail by plane, and explored by jeep and on foot before the final site was pinpointed: Kitt Peak, a lonely monolith that rises some 4500 feet above the surrounding desert floor. But Kitt Peak (which, by the way, was "Carson's Peak" in the Irwin Allen TV movie, *A Fire in the Sky*) is located on the eastern border of the Papago Indian Reservation, and the mountain holds a sacred significance for the Papagos as the home of the god Eel-ol-top. The site could not be used without the tribe granting a lease.

After two meetings with astronomers, the Papagos denied permission. Oddly, the major problem was that the astronomers were having difficulty explaining what an observatory was. After months of delay, the tribal council was invited to the nearby University of Arizona for a look at the Moon through a telescope already on the campus.

Returning to the reservation, the Papagos dubbed the astronomers "the men with long eyes" and granted the lease, since they now felt that the work to be accomplished on the mountain would be in full accord with the principles of the god who lived there. Eel-ol-top is the Papago god who watches over the heavens. Not bad for coincidence... or fate.

Today, a corporation of 14 universities share the responsibilities for operating Kitt Peak, including the University of Arizona, Cal Tech, Yale, Harvard and Colorado. A staff of 50 people, including between 25 and

30 astronomers, generally operates the mountain facility, in addition to about 300 supporting people at the Tucson headquarters. Telescope time is divided between the regular staff (about 40 percent) and visiting astronomers who usually must apply for time a year or so in advance.

The largest observatory on the mountain, housing the 158-inch (four-meter) Mayall Telescope, is a gleaming white 19-story tower that is easily visible for many miles as you approach the paved road that meanders up the Peak. Towering above all the other installations there, the \$10 million facility sports a 15-ton fused quartz mirror within a 360-ton frame supported almost 100 feet above ground level. It is so delicately balanced (on oil-pressure bearings) that it can track celestial objects with the aid of only a one-half horsepower motor, yet is so ruggedly constructed that one-ton attachments can be bolted on with no effect in mechanical performance.

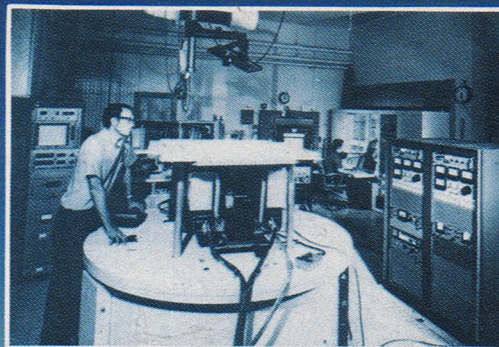
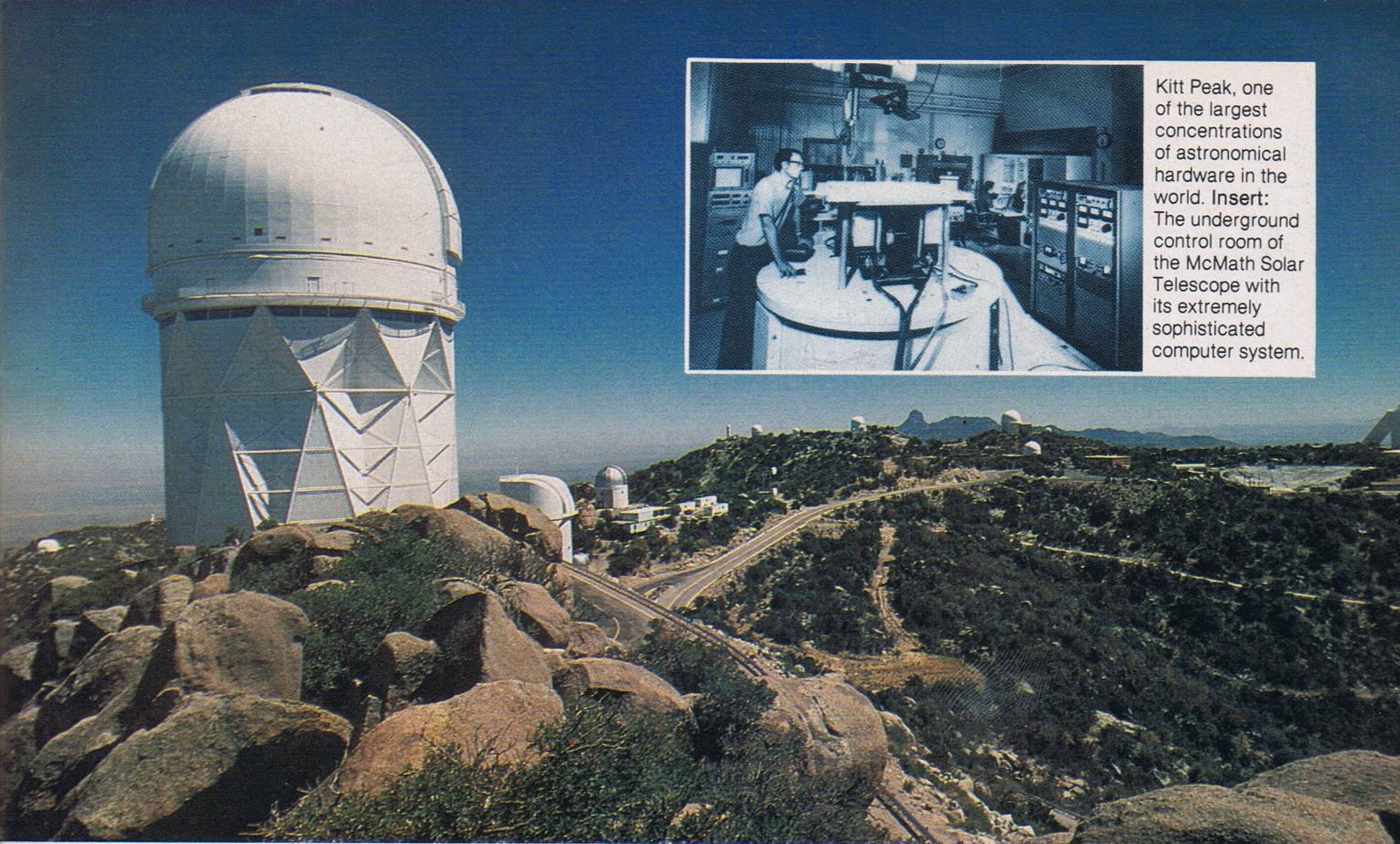
The Mayall Telescope is the second largest and most advanced device of its type in the United States. Equipped with electronic amplification and guided by computers, it can be instructed to perform a task by remote control from the Tucson headquarters, 50 miles away.

This image of automated, electronicized astronomy may fly in the face of how most people picture astronomers working. The portrait of the bearded professor wearing a ragged sweater, puffing on his pipe as he peers for hours into a telescope eyepiece is as outmoded as traveling cross-country via wagon train. Virtually all telescopes engaged in professional research today are part of elaborate computer systems and astronomers "see" the heavens on computer print-outs and electronic image amplified and modified photographs.

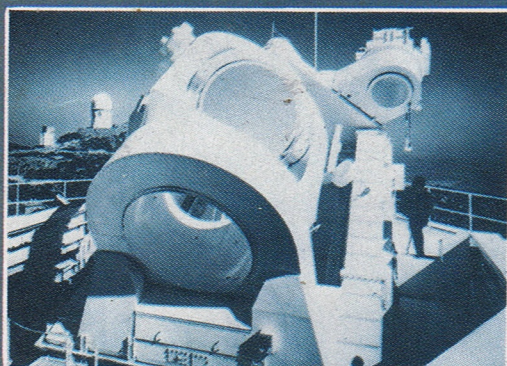
In essence, the modern telescope is a giant peripheral device for a computer, what the *Enterprise* crew would simply call a "sensor" (so that's what Mr. Spock fools around with at his post on the bridge!).

The oddest looking structure on Kitt Peak is the McMath Solar Telescope, the largest of its kind in the world and resembling nothing so much as a giant upside-down check mark in the ground. Over 500 feet long, this slanting shaft installation is more than half underground, supported above the peak by a 100-foot tower.

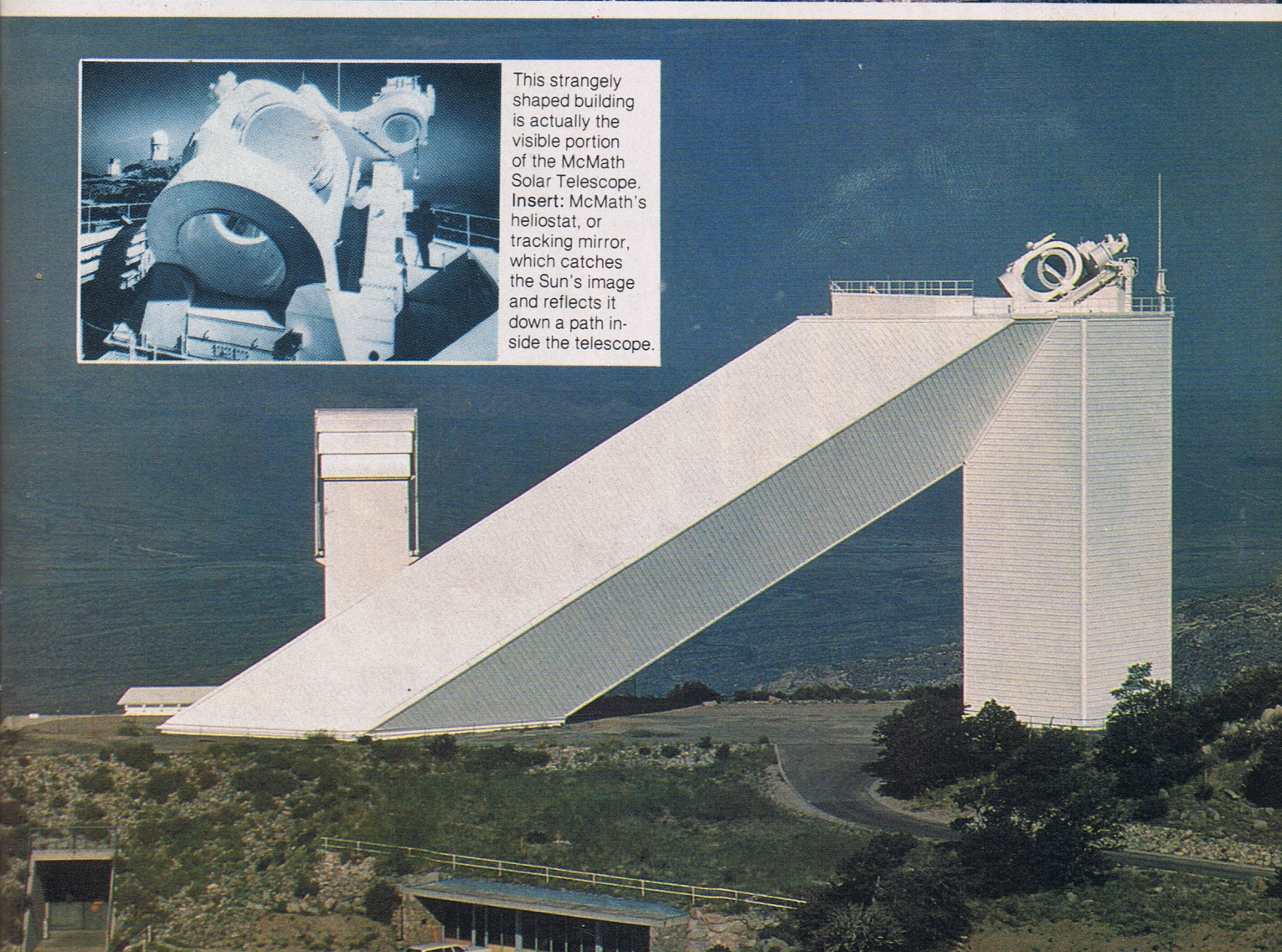
(continued on page 48)



Kitt Peak, one of the largest concentrations of astronomical hardware in the world. Insert: The underground control room of the McMath Solar Telescope with its extremely sophisticated computer system.



This strangely shaped building is actually the visible portion of the McMath Solar Telescope. Insert: McMath's heliostat, or tracking mirror, which catches the Sun's image and reflects it down a path inside the telescope.



A photograph of a laboratory setup. In the foreground, a rack of test tubes holds liquids of various colors: yellow, orange, red, and purple. To the right, a Bunsen burner is lit, with a blue flame and white smoke rising from it. The background is dark, making the colorful liquids and the flame stand out.

NEW IMPROVED HUMAN

Genetic engineers
have created
new forms
of bacterial life
in the laboratory,
but are we
ready for them
to redesign
human DNA?

By RICHARD HUTTON

Less than ten years ago, J.B.S. Haldane, a prominent British scientist, did something very few scientists allow themselves to do: he threw caution out the window and let his imagination loose in the future. Haldane was a biologist, working in the esoteric realm of test-tubes and centrifuges and micro-organisms. But it was clear to him that what he and his colleagues were doing wouldn't always be confined to the laboratory. Some day soon—maybe not tomorrow, or even in 50 years, but soon enough—genetic engineering would meet the space age.

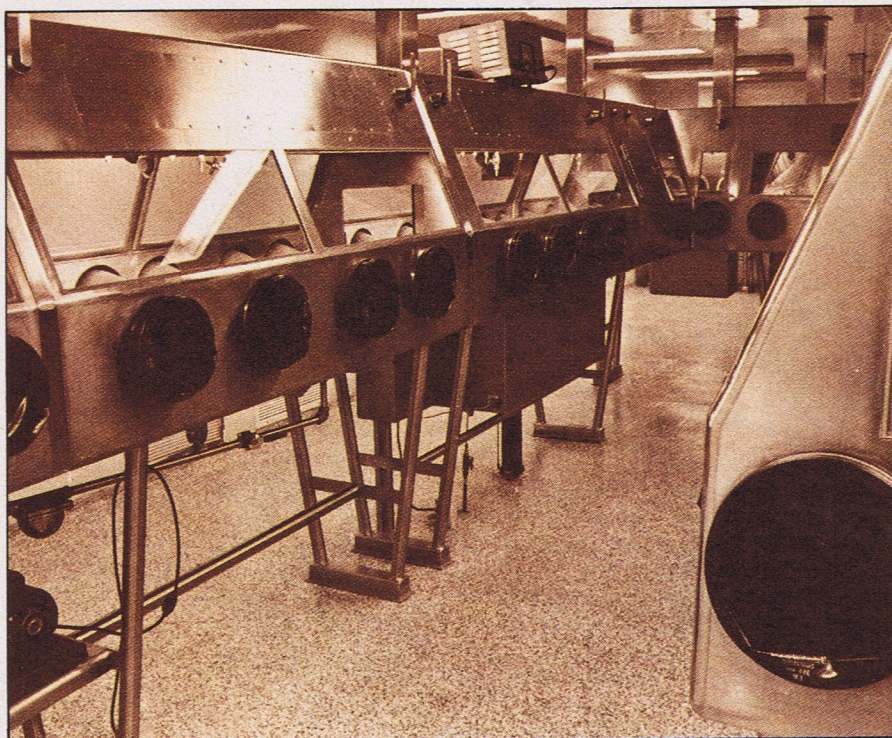
As a scientist, Haldane concentrated on what was practical in his time. But he foresaw a world in which we could have complete mastery over our genes and our heredity, in which we could design and grow whatever was required to fit our needs. Because extensive space travel would result in a class of space jockeys who seldom, if ever, got their feet on solid ground, Haldane envisioned

astronauts without legs; for contact with new planets or forms of life he contemplated breeding an "aseptic man," germ-free both inside and out, with hairless skin like latex and an air filtration system instead of lungs; for work on planets with low gravity he suggested long, lean individuals equipped with prehensile tails and feet (so they could get a grip on something as they worked with their hands); and for getting around on high-

Richard Hutton is the author of Bio-Revolution: DNA and The Ethics of Man-Made Life (NAL/Mentor, 1978). He is currently at work on a book about space.

PHOTO: MICHAEL SULLIVAN





Biological safety cabinets (at Atlanta's Center for Disease Control) provide a high-risk containment area for genetic research. Renegade bacteria cannot escape.

gravity planets, he figured that breeds of achondroplastic dwarfs and quadrupeds, with their stocky builds and low centers of gravity, would prove ideal.

These all seemed like fine fantasies then, projected far enough into the future to make any meaningful criticism unnecessary and absurd. Genetics, after all, was still in its infancy. Scientists knew all about deoxyribonucleic acid (DNA), the basic building blocks of life, and the blueprint for heredity; they even knew exactly how it worked. But learning the secrets of the tiny molecules and controlling them in the laboratory were two different things. Manipulating genes and interfering in the natural course of evolution—even in the smallest virus or bacterium—still seemed more like science fiction than science prediction. Haldane's prophecies were read by some with curiosity and wonder. But others dismissed them as belonging to the same school of thought as Erich von Daniken and the Bermuda Triangle group of theorists. Without enough information, Haldane had to be whistling in the wind. There was enough time to worry about a world of Dr. Frankenstein's later, when the basic science of genetic engineering had at least been shown to be possible.

It's less than a decade later now, and those Dr. Frankenstein's are already hiring themselves patent attorneys. For in the few short years since Haldane's wild guesses, the newest scientific upheaval—the biological revolution—has begun.

If measured by the yardstick of Haldane's imagination, the biological revelations that have surfaced so far seem modest enough. Practically all the research has involved micro-organisms—single-celled bacteria and viruses (which are little more than squiggles of DNA wrapped in protein coats). Never-

theless, the revolution itself has not dawned gradually. Its beginnings, in fact, can be pinpointed to one year—1973—and to the development of a single extraordinary scientific technique—called *recombination*.

As a genetic tool, recombination is a piece of elegant science. It is also deceptively simple and straightforward: the researcher extracts strands of DNA from two different sources, recombines them (splicing them together), and returns them to the original host, so that the information carried by the hybrid genetic material can be expressed. Conceptually it is like cutting a piece of recorded cassette tape, splicing in a piece of tape from a different recording, and then playing the modified tape to determine whether the splicing was successful. Genetically, a researcher can use recombination to lift a genetic characteristic—the capacity to resist penicillin, for example—from one kind of bacterium and transfer it to another. His scissors, however, are tiny molecules called enzymes, his tape, strands of DNA so small that he would have to destroy them to see them. The only way he can discover whether the experiment has succeeded is to pour some penicillin onto his new creation and see if his bacteria survive.

The research has thus far been confined to these simple animals. But even now it is beginning to have a profound impact upon our lives. Recently, researchers in California actually genetically engineered a bacterium that can produce human insulin; they isolated the appropriate gene from the pancreas and transferred it to a hardy little bug called *E. coli*. The implications of this feat are enormous. Currently, the insulin used by diabetics is a purified mixture extracted from the pancreases of pigs and cows slaughtered for food. The worldwide demand for it has put a strain on supplies, and producers have

predicted a time very soon when the demand will exceed the amount they can manufacture. In addition, some diabetics develop allergic reactions to the animal insulin or to the impurities that manufacturers still cannot separate from it. Insulin-producing *E. coli* circumvents all of these problems. Very soon, 40 million diabetics around the world will have a safe, consistent, inexpensive supply of the one substance they need to stay alive.

Success with insulin may lead to the production of every organically derived medicine known to man. The clotting factor, a protein which protects normal people from excessive blood loss and which is missing in hemophiliacs as a result of a single genetic defect, also seems susceptible to production in small bacterial factories. And antibiotics, which are now isolated from bacteria and fungi (except for the penicillins, which are grown synthetically), can be introduced into more efficient, more prolific organisms, increasing their availability and cutting their cost. (Already the Upjohn Company has been given patent protection for a bacterium that can manufacture antibiotics—the first time anybody has ever patented a new form of life.)

Commercially, the potential of these hybrid bugs is vast. Bacteria that collect trace metals as a by-product already exist in nature. Transferring that characteristic to a voracious, prolific bacterium capable of flourishing on the ocean floor could lead to vast underwater metal farms, where copper, magnesium, gold and iron are extracted from the silt by bacteria. Ocean miners will simply "harvest" the metals by collecting their patented bacterium.

Meanwhile, on the surface, other specially engineered bacteria can be lapping up oil after accidental spills at sea, while on the coast, huge recycling plants will be set up to house organisms that can turn garbage into fuel.

Theoretically, all of this—and more—is already possible. The techniques of genetic engineering exist; the organisms are known; some of the appropriate genes have been isolated; and some of the new bacteria have even been created. All that is needed is a green light for more research and a ton of money, and the people who got us to the Moon in a decade will provide us with microscopic slaves that can clean the environment, ease the energy crunch, and cure countless diseases.

Slightly farther in the future are the breakthroughs that will make J.B.S. Haldane seem more like a prophet than a dreamer. While we are far from controlling even a small part of the billions of pieces of information housed in human chromosomes, we are closer than you might think. For DNA is DNA is DNA: the genes of an amoeba are built in the same way and from the same materials as the genes of a rat or a rabbit or a rose. And the techniques that work today on *E. coli* will someday be used on humans.

It isn't necessary to conceive of rubber-skinned ambassadors or legless astronauts to recognize the other, more earthbound possibilities of the new genetics. Soon enough, genetic surgery will be as much a part of our medical repertoire as the scalpel. When

the defective gene causing hemophilia, sickle-cell anemia, or cleft palates, or the chromosome responsible for Mongolism, can be isolated, it can be removed from every cell in the body and replaced with a healthy gene or chromosome. And with the imminence of techniques like cloning, artificial insemination and in ovulation, and test-tube births, and with the development of artificial wombs and the like, the process of procreation is clearly about to leave the bedroom to enter the laboratory. That particular brave new world is now such a real possibility that other scientists are now coming to support Haldane's once bizarre visions.

One prominent microbiologist, Zsolt Harsanyi, whose job as Project Director of the Committee for the Assessment of the Impacts of Applied Genetics for the U.S. Congress is to plot the future of biological research, recently said, "I can imagine a time when we will select and not settle for our genetic fate. It won't be long before we will actually be able to decide on the exact physical and emotional qualities of our children. The new biology means the end of the genetic coin flip."

Unfortunately, that enticing prospect might not be all goodness and light. For beyond the technical beauty of it all lie the darker questions of danger and risk.

Scientists are not unaware of some of the dangers involved. In the mid-1970s, they began a debate among themselves which questioned whether or not the basic research itself was safe. Could an accident in the laboratory lead to the release of novel organisms into the world, precipitating an epidemic of some kind, or a threat to the natural balance of life on Earth? While the majority concluded that the research was in fact safe, they came up with a foolproof safeguard. Using the techniques of genetic engineering, they created a laboratory strain of *E. coli*—the

bacterium preferred for most genetic experiments—that is so weak and helpless that only one in 100 million can survive outside its special laboratory environment.

There are, however, other problems of risk that have yet to be explored. With the biological revolution, we will someday have the power to create life, to order nature as we see fit, to, in short, play God. That is a power that we have been working toward ever since the first semi-erect humanoid thought of using a stick to knock an unreachable banana out of a tree. Genetics is simply the latest in a long line of scientific assaults against nature. With each skirmish, we have had to learn to adapt to a rate of progress that no other creature born of evolution—except perhaps the cockroach—has been able to withstand. Now, suddenly, the enemy is changing. The old battle, between man and nature, has been replaced by a new one, between man and the products of his own mind. It is us against us, and nature is nothing more than the turf over which we are fighting.

The centerpiece in this particular war, the real prize, is evolution. Natural evolution has been tested by time and experience; it works. It has ensured, for example, that if two monkeys are swinging in the trees, the one with the weaker prehensile tail will ultimately become some lion's lunch, while the stronger one will pass on his capacities to later generations of monkeys. It has weeded out genetic weakness by making sure that defective organisms cannot compete and survive to pass on their problems. And it has kept the natural gene pool—the total of all possible genetic combinations—as diversified and as broad as possible, so that we have the best possible chance of adapting to and surviving even unforeseen eventualities.

Some day, controlling evolution will become another of our scientific tools. And

the real question is whether or not we will learn to use it wisely. Our past experiences are not encouraging: we developed industry and have managed since to poison huge chunks of the Earth and ravage its natural resources; we began to gain a measure of control over disease and ran smack into a population explosion which threatens to consume the resources that remain and to strain the land beyond its ability to provide food; we learned to split the atom, promptly blew apart two cities, and still live under the constant, though remote, threat of annihilation. Whenever we learn something new, we tend to act like the kid who has just learned how to light a match but who still has no idea what fire can do; so he touches the flame to the living room curtains just to see what will happen.

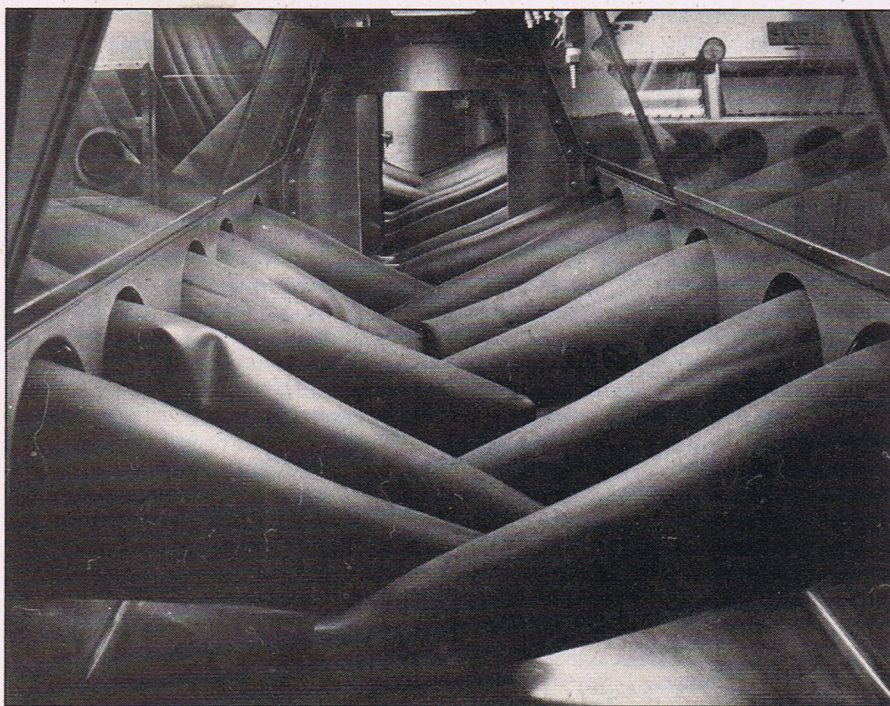
What might happen in this instance is that we could experiment ourselves right out of existence. At one bizarre extreme, it is not too hard to imagine our gaining control over the mechanism that regulates intelligence, emotions, or old age and manipulating it drastically enough to render the present form of our own species obsolete.

The issue of risk, then, has to do with knowledge. When it is not being used, knowledge is static, stable, harmless. But when it moves out of the laboratory and into the realm of the practical, it can become dangerous. It can accumulate so quickly that we simply are not able to handle it—with the result that it begins to handle us.

In biology especially, the temptation is to fight dangerous knowledge by accumulating more knowledge—to seek new truths so that we can cope with the old. The problem is that the new truths can contain their own seeds of danger; by going after them, we might find ourselves pushed into a never-ending spiral of action and reaction, of combatting imminent danger with future danger, of mounting complexity on complexity, tool upon tool—until we finally reach the limits of our capacity to adapt. The vast potential of genetic engineering seems so attractive, and the dangers are so vague and ill-defined, that it seems easier just to let things progress naturally, to allow science to push forward while we assume that something will inevitably surface to relieve the pressure and remove the danger. After all, something always has.

Or so it seems. But if we take the time to look, if we superimpose the legless astronaut over the armless child of thalidomide, the swarm of oil-eating bacteria over the mushroom cloud, it becomes clear that the heat has always been on. We are still around, not because we have successfully discovered solutions to the hard problems of science, but because science is only now reaching the point at which it is powerful enough to destroy us.

Now, with the coming of the new genetics, we might finally have reached that crossroad. For the biological revolution lies somewhere between the taming of fire and the invention of the wheel in its scope, somewhere well beyond the splitting of the atom in its potential impact. With all its promise and peril, it is upon us. And unless we begin now to prepare for its power, there will soon be no way for us to control it.



Inside a biological safety cabinet: just one of the elements of containment required to carry out fail-safe experiments that manufacture new forms of life.

Vonda McIntyre

SF fan-turned-writer McIntyre pens characters for keeps. Thus far, her heroine "Snake" has won two Nebula awards for outstanding fiction.

By ED NAHA

In 1973, the healer called "Snake" made her first appearance in science fiction literature. A mystical figure who offered hope to a desolate and disparaging world, Snake distilled her primitive medicine from the venom of the cobra and rattlesnake she carried with her. Her magical aura was derived from the power of her third reptilian companion, the alien dreamsnake named "Grass." Snake and Grass were two characters in an intriguing novelette entitled "Of Mist, Grass and Sand" penned by a promising young writer, Vonda McIntyre. The piece of short fiction was promptly awarded a Nebula by the Science Fiction Writers of America.

A few months ago, Snake and Grass, now part of a fully realized novel entitled *Dreamsnake*, won their second Nebula. In the six years since Snake's debut, McIntyre has clearly established herself as a science fiction writer to be reckoned with. *Dreamsnake* impressed legions of critics; mixing together magic, empathic prowess and genetic mystery. Like her fictitious character Snake, Vonda McIntyre seemed to arise out of nowhere and then simply ease into her profession. She didn't actively court fame, it just seemed to shadow her. As a result, the two-time Nebula award winner finds her newfound popularity somewhat amusing.

"I'm just starting to get used to it," she laughs. "I don't have a nervous fit when I see someone stalking me with a tape recorder anymore. I used to just panic. I'm told that when you're popular, you have to contend with the 'pressures' of celebrity status. I love them. I don't mind signing autographs. It's a pleasure. I love talking to fans."

McIntyre's down-to-Earth approach to life is evident in her writing as well, which may explain some of the success of *Dreamsnake*. "It's a book where people deal with each other on the grounds of who they are in terms of their abilities and not who they are in terms of what caste system they're part of. In *Dreamsnake*, people react to each other because of accomplishments, not because they're a man or a woman, short or tall or because they belong to some phony group society has chosen to deify at the moment."

Sitting in her agent's New York office, the unaffected McIntyre pauses before once



PHOTO: JEFF LEVIN

again trying to examine her style. "I try to get this effect in all my work. If I wanted to write about a sexist society, I'd write mainstream. I don't see any point for anyone who is a feminist or a humanist or anything like that to reconstruct the problems of our society in science fiction. I think that's a waste of science fiction. I think a lot of writers reconstruct our society in science fiction because they're comfortable with present day life. I'm not. I'm interested in change, in other possibilities. Sometimes I find myself writing something that is hopelessly naive but I like it. So, I leave it in."

McIntyre's dedication to science fiction of change has led her on a professional path of near epic proportions. "I've never had any other fulltime occupation but as a writer."

"My dad has always read science fiction, so there were always SF books around the house. I don't remember ever actually learning how to read but *Waldo and Magic Inc.* was the first book I remember reading. Since I've always read science fiction, writing it seemed like a very natural progression for me. I wrote a few things in high school that were truly awful. Then, attempting to be sensible, I put my literary interests aside and decided to become a scientist."

"I majored in biology in college. I have half a PhD in genetics. I was a year into graduate school when I realized that, as a scientist, I was a pretty good science fiction writer. I sort of crept off before any of my

professors noticed that, too."

During college, McIntyre started to work in earnest on her literary career. "I think I was a junior when I sold my first story. The first couple of years in school I was pretty busy, so I didn't write too much. The genetics helped me a great deal in science fiction, in that genetic engineers and astronomers have been the two groups over the past couple of years who are making all the new discoveries. I was actually in a field that was ripe for exploitation in SF. Not just exploitation, but exploration. I could examine all of the things that genetics could make possible. I was writing all this when I was in grad school. What really prodded me to write was the discovery of science fiction conventions. I went to my first one during school and decided to sit down at the typewriter again."

Through SF conventions, McIntyre made contacts with other writers both established and otherwise. It was at this point that she heard of the Clarion workshops, a series of literary seminars designed to strengthen the literary muscles of up-and-coming SF authors. It was at one of these workshops that Snake and Grass were born.

"Avram Davidson taught one of the weeks at the Clarion West workshop in Seattle in 1972," McIntyre recounts. "He was wonderful. He gave this incredible assignment that had everyone just going bonkers. He took two lists of words. One was a list of technical things like rockets, solar flares and those sorts of things. The other list was made up of pastoral words: grass, trees, bushes. He cut the lists up and put one stack of words in one styrofoam cup and the other stack in another cup. He had every student pick one word out of each cup. Our job was to take the two words and create a story around them."

"We left the classroom stunned. We just stared at our words. It was like looking at fortunes in a fortune cookie. Your initial reaction is 'what the hell is this?' One guy got 'Alpha Centuri' and 'laughter.' Another guy got 'geriatrics' and 'sheep.' I got 'snake' and 'cow.' (I guess *snake* was from the technical list.) We broke our brains trying to be clever with these words."

"I sort of scratched my head, wandered around and wondered what to do. I wound up with a main character called 'Snake,' a

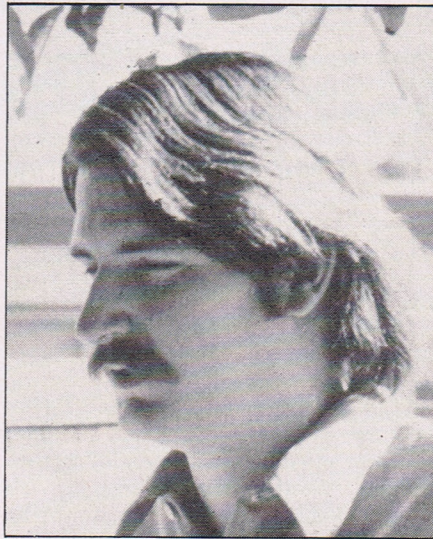
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John Varley

Building a future history, says the Nebula Award-winning author, requires spending a lot of time there.

By ROBIN SNELSON

When John Varley won this year's Nebula Award for his novella "The Persistence of Vision" ("my favorite of all the things I've written"), he confided that it was both an honor and a relief. "I've had so many nominations in the last few years—and come in second so many times—that I swore to myself I just wanted to win one award, then I wouldn't worry about awards ever again." Tall and softspoken, 31-year-old Varley (who goes by his middle name, Herb) wrote stories as a kid growing up in small Texas towns. After a year of college, starting out as a physics major then switching to English ("I was going to be a film script writer"), he dropped out of school and went on the road. "I bummed around, went to California and the southwest, stayed with friends, took some drugs, spent a month in jail on a bum rap. . . didn't write at all, didn't even read much. . . ." His first steady job was as a live-in attendant for a woman who had been disabled with polio. "A paid father—my job was to take care of her children. She could take care of herself." When he eventually married Anet Mconel and the state objected to paying him to be an attendant for his wife, Herb Varley decided to try to make some money writing. "I always knew in the back of my head that I'd start writing again. When I finally did, it was because of money problems. What I thought—and it turned out I was rather naive—was that I could make a living if I could sell some short stories. I was lucky and it turned out that I sold everything I wrote—except the first thing, a novel. But I had no reason to believe I could do that at the time." After the gradual discovery that even when he sold all his short stories, it still wasn't a living, Varley decided to try another novel. He wrote *The Ophiuchi Hotline*, and has been supporting himself and his family with his writing for the last three years. Some of his best short stories are collected under the title *The Persistence of Vision*, and his second novel, *Titan*, was published this year. He is currently at work on a sequel to *Titan*, to be called *Wizard*. With the exception of a few stories (including "The Persistence of Vision" and the *Titan* soon-to-be-trilogy), most of Varley's published works are set in an intricately detailed and well-imagined future



known as the *Eight Worlds*. In this future history, humans have been evicted from Earth and are scattered throughout the solar system. Sex changes are commonplace and unremarkable; instant clones and memory recording techniques provide a sort of serial immortality, and esoteric medical engineering is employed for purely cosmetic purposes, as well as for simple survival. Although his writing career is still young, Varley's facility with startling ideas and with the essential science fiction craft of world-building are well-developed. In New York last April to accept the Nebula, Herb Varley chain-smoked in his hotel room and stole furtive glances at a sandwich on the bureau as he talked about the genesis of his *Eight Worlds* series.

It evolved from the first novel I ever wrote, which never sold. It was called *Gas Giant* and it detailed the story of the invasion of Earth by creatures from a gas giant planet like Jupiter. These creatures are actually the intelligences of the universe. I postulated that there are two levels of intelligence: these gas giant beings are one, and the level below them includes dolphins, whales, aquatic mammals. What we might want to call the third level of intelligence—but what the gas giant creatures would not concede as intelligence at all—is human beings. They lump humans together with birds and squirrels and ants and other things that do a lot of building. They don't do any building because they are so constituted that they. . . well, this is something I can't specify, because as a human being I would not

be able to understand it. But they're on a plane of some sort that is removed from us. Consider it to be a fourth dimension, or something like that.

Most of the stories we've read in science fiction have to do with human beings going out and conquering space. I thought, it's quite possible we'll go out there and find we can't conquer space, that it's already been conquered by beings that we cannot equal in any way. I'm not advocating that viewpoint, but I think it's a possibility.

I wrote that novel in 1973. I spent about half a year on it and it was the first thing I'd written in years. It never sold, for very good reasons. It's not very well written. The plot is okay, but the writing is terrible. But I had to get it out of my system and learn a few things. Then I started writing short stories and did about 15 of them, I think, starting from the premise of the *Invasion* and taking it generally 300 to 400 to 500 years later, when the Earth has been completely cleaned out of technological human beings.

In the beginning, technological humanity survives on a Moonbase, and on a very small base on Mars which had to be abandoned. For several hundred years, tool-using humans were just on the Moon, until their population started growing and they started to expand through the solar system. All they could do was live on what you'd have to regard as the junk planets of the solar system, the ones that don't have any natural life-sustaining capacities for human beings. The *Eight Worlds*, as I worked them out, were Mercury, Venus, the Moon, Mars—and we skip Jupiter entirely because the gas giant beings are there, and human beings are not going to mess with them at all—then Titan would be number five, and six and seven are the two largest moons of Uranus and Neptune, and then Pluto.

In addition to those eight worlds, there's a separate human society in the rings of Saturn, which does not really interact with the rest of the human beings a great deal. They are symbiotic creatures living with plant organisms which have been manufactured to provide a perfect symbiotic relationship with human beings living in free space. They wrap around a human and provide an environment. They consume human wastes and give out oxygen,

(continued on page 57)

THE BLACK HOLE: DISNEY'S SUPER SPACE OPERA

This Christmas, Walt Disney Studios will unveil their most costly project to date—a super science fiction epic with the accent on science fact.

By DAVID HOUSTON

Only four days behind schedule and still headed for a December, 1979 release, Walt Disney's *The Black Hole* promises to be a significant entry in the industry-wide *Star Wars* box office sweepstakes. This phantasmagoric space epic represents significant departures for the studio that brought the world such diverse family entertainment as *Fantasia*, *The Absent-Minded Professor*, *The Living Desert*, Verne's *20,000 Leagues Under the Sea*, and *The Mickey Mouse Club*.

A budget of \$17.5 million makes *The Black Hole* the most costly film in Disney history. Never before has virtually every stage, shop and facility on the Disney lot been devoted to a single project. More importantly, for the first time in its history, the studio is taking a back seat to the production itself. Company letterheads say *The Black Hole*, not Walt Disney Productions, and it is rumored that this will hold true even for ad posters and campaigns. The entire cast is made up of actors not previously associated with the Disney G-rated line of products. And it seems likely that *The Black Hole* will be rated PG, a startling departure for the "G" oriented studio. Disney spokesmen claim, "We are making this one for adults."

The setting for *The Black Hole* is the distant future, when space has proved to be a realm of limitless resources. A story unfolds involving a deep-space probe to the vicinity of a black hole—where explorers encounter a space habitat of gargantuan proportions overlorded by a Captain-Nemo-type ambivalent villain. The space czar maintains an army of marauding robots and harbors peculiar designs on the universe. During the film's climax, the Earth probe must find a way to cooperate with the dangerous man, in order to forestall their being pulled irrevers-

ibly into the dreaded black hole. Disaster occurs despite their efforts, and only a handful of people and robots make a daring escape.

Populating this story (scripted by Jeb Rosebrook and Gerry Day, from a story by Rosebrook, Bob Barbash and Richard Landau) are Anthony Perkins as Dr. Alex Durant, Maximilian Schell as the treacherous Dr. Hans Reinhardt, Yvette Mimieux as Dr. Kate McCrae, Robert Forster as Dan Holland, Ernest Borgnine as Harry Booth, and Joseph Bottoms as First Officer Charles Pizer.

Some of the film's other principles are robots. Dr. Reinhardt relies heavily on Max, his second-in-command and the leader of his troops. Charles has a robot sidekick, Vincent (there's even an earlier model of a Vincent, who operates with one leg, called Old Bob), and then there's Reinhardt's massive army of "humanoids."

During production, in an on-the-set chat, Yvette Mimieux expressed appreciation for the science behind the story. She said she was amazed that Disney executives were, at that point, unsure about the title—torn between *The Black Hole* and *Space Probe*. "They're afraid no one will understand what black hole means!" she said. When she was first hired they asked her if she knew what a black hole was. An astronomy buff, she replied, "Of course I know."

Ron Miller, Disney's executive vice president in charge of production and creative affairs, confirms that, at present, *The Black Hole* will be the final title. He explains the appealing story advantages in the concept:

"Black holes are a mystery even to the scientists who predicted them. Some speculate that time slows and finally stops at their edge. Others suggest that a black hole may be a path to another universe. Another theory is

that a person entering a black hole could find himself back where he started."

One of those way-out concepts is utilized in the film's final moments—but no one is divulging which one.

The Black Hole is directed by Gary Nelson—who was nominated for an Emmy for *Washington Behind Closed Doors*, and who by reputation is as comfortable with "high drama" as comedy. He began cranking the cameras last October 11th, and did not "wrap" until April 6th of this year—a schedule many times longer than conventional film calendars at any studio.

"Drab and dreary," sums up the long months of filming for second-assistant director Chris Miller (Ron's son), "because so much of the live-action work is just in preparation for special effects. Nothing much seems to be happening on the set. Then we'll go in and take a look at the dailies (film shot the day before) and get all excited. It really looks tremendous."

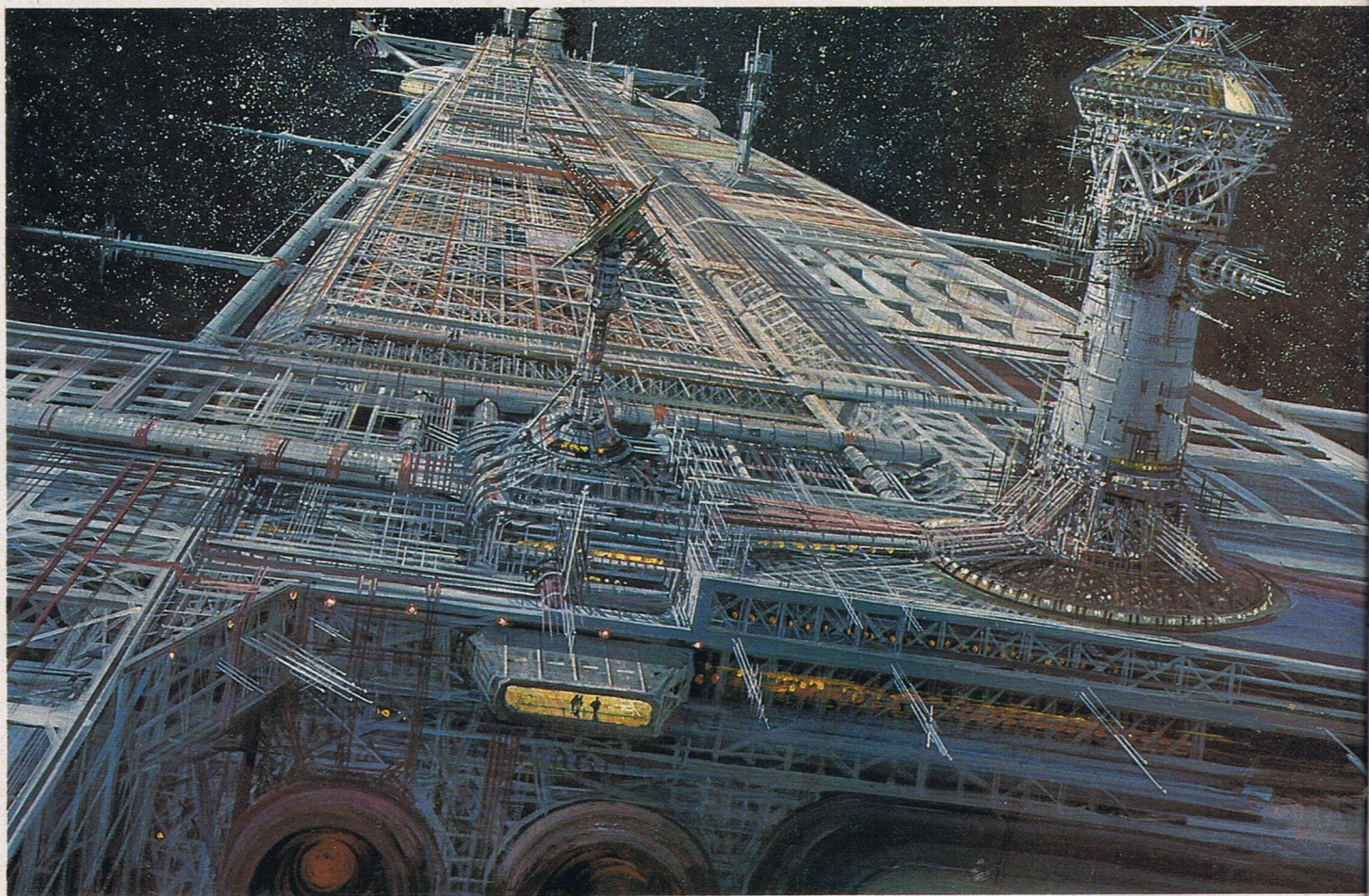
Another second-assistant director, Joe Moore, concurs. "The most significant event I can remember," he quips, "is the day I was supposed to go out for bagels and lox and I came back with bagels and cod. They started calling me Captain Cod."

As they relate this, rigging is being completed that will suspend Joe Bottoms, apparently weightless, high over the sound stage on which is spread a vast setting of burning, twisted spaceship wreckage.

Four Academy Award winners are supervising special effects: Eustace Lycott (*Mary Poppins* and *Bedknobs and Broomsticks*) and Art Cruickshank (*Fantastic Voyage*) are

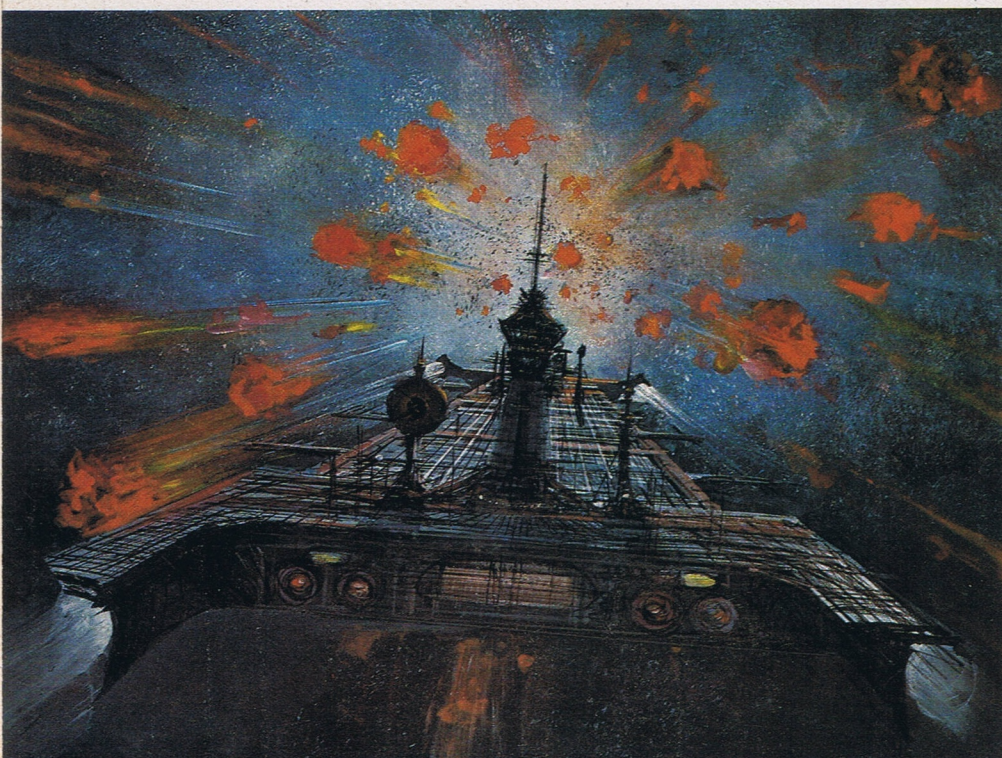
Ellenshaw art depicting the escape of a handful of survivors from the crippled spaceship/laboratory *The Cygnus*.





in charge of special photographic effects; Danny Lee (*Bedknobs and Broomsticks*) is supervising visual effects; and Peter Ellenshaw (*Mary Poppins*) is overall production designer. Peter's son, Harrison, is in charge of the film's record-breaking number of matte paintings—150. Though not yet an Oscar winner, Harrison did the mattes for *Star Wars* and *The Man Who Fell to Earth*.

Peter Ellenshaw—an internationally known landscape artist—first worked for Disney on *20,000 Leagues Under the Sea*, for which he executed mattes and assisted with model designs and special effects. Ellenshaw's painterly approach to film is evident throughout *The Black Hole*. His conceptualization manifests itself in the pre-production art (some of it reproduced here) and in the

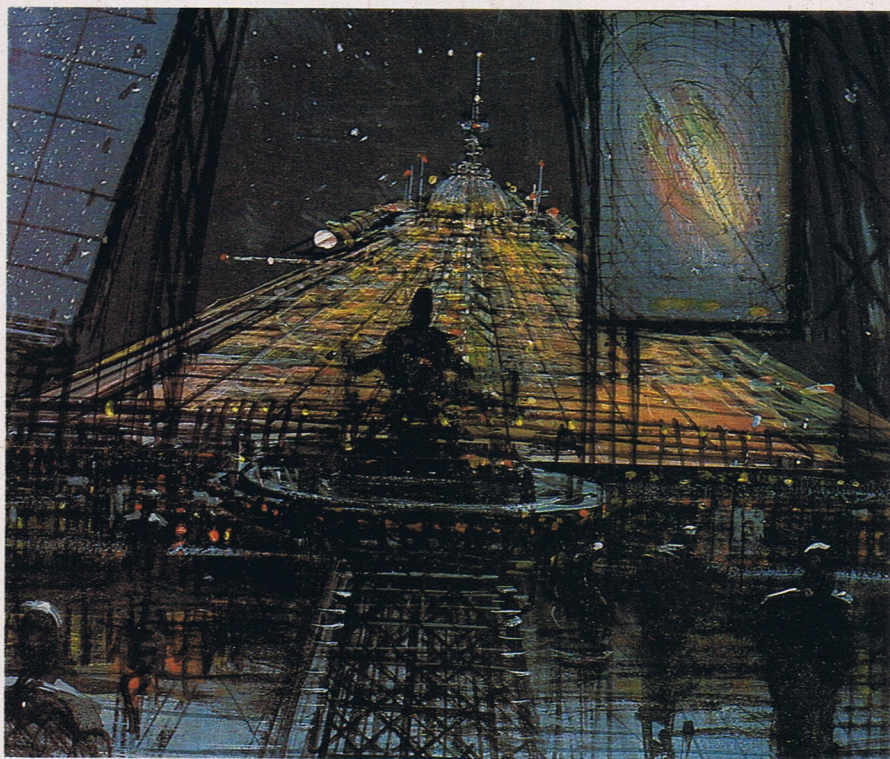




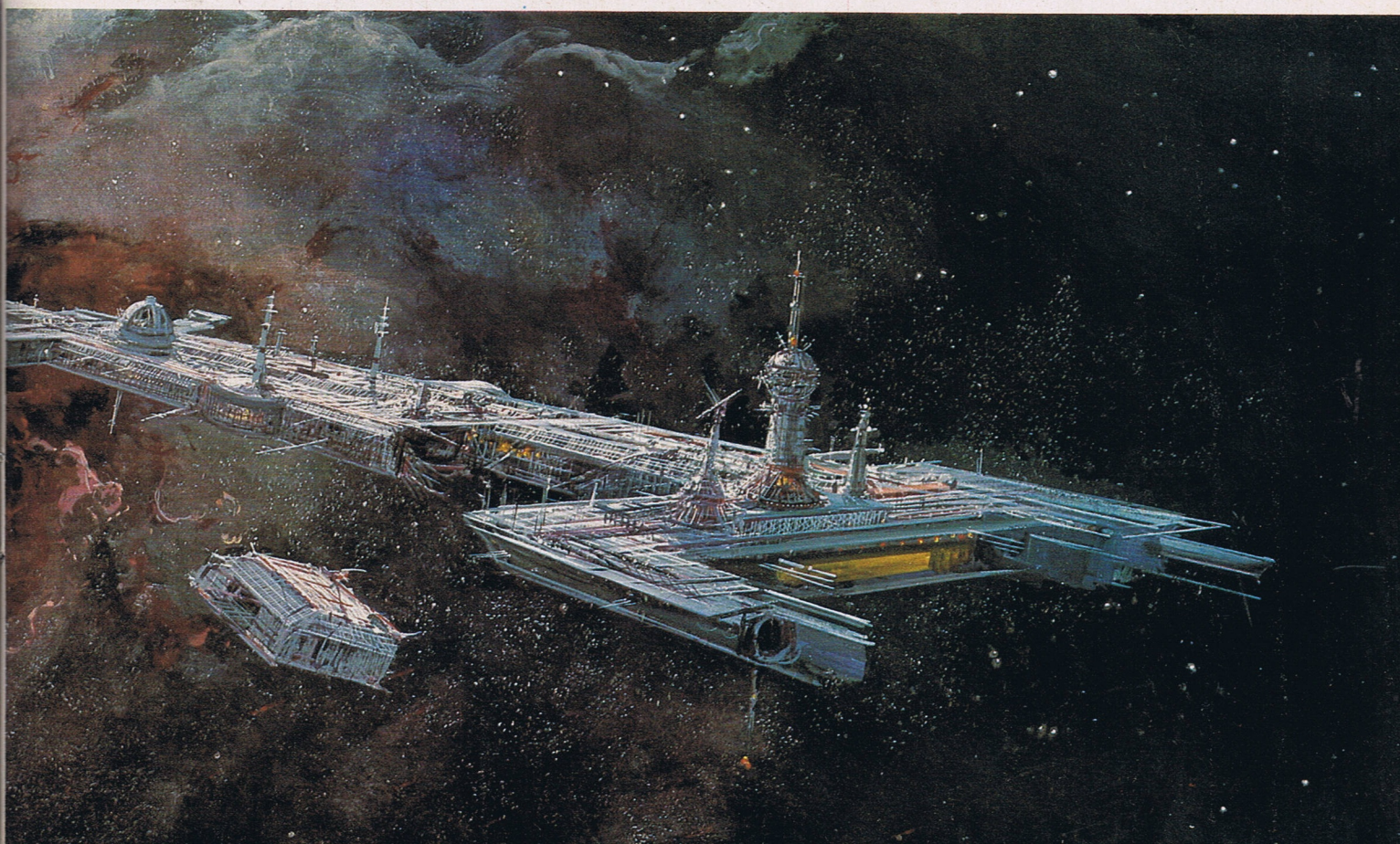
myriad storyboards on easels everywhere on the Disney lot. The storyboards prescribe every shot of every scene in the film.

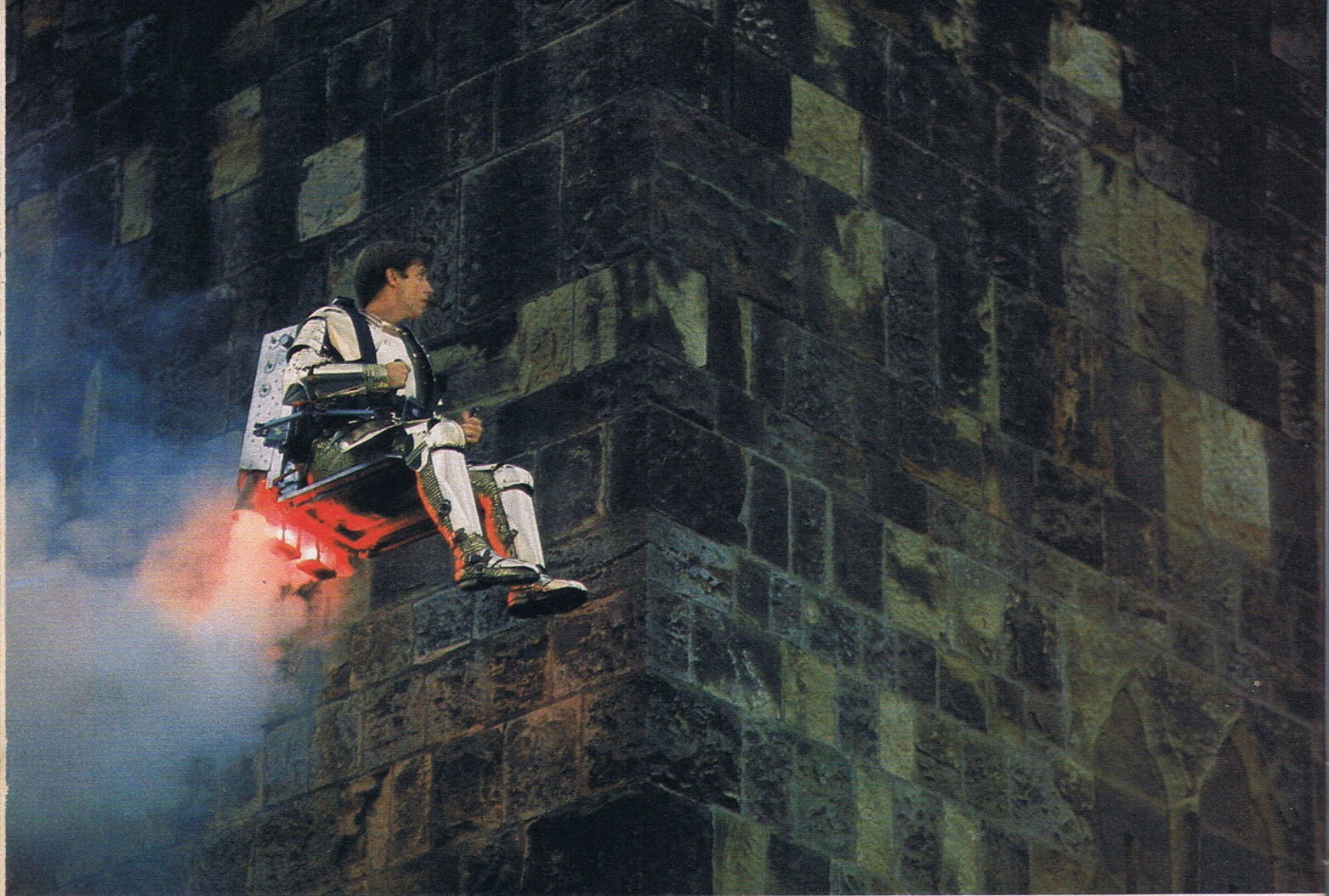
Disney Studios—still heavily involved in completing matte paintings and special effects—has been at work for five years prepar-

ing *The Black Hole*, and has worked intensively and almost exclusively on it for the past 16 months. With talents like these devoting so much time, Disney artisans are sure to succeed in their attempt to create a memorable classic of the space-adventure genre. 



Above left: *The Cygnus*, the titanic space habitat and lab of the evil Dr. Reinhardt (Maximilian Schell). Above right: Aboard the *Cygnus*' domed command center. On film, this scene is a composite of seven live-action inserts tied together by a matte painting and filmed with a moving camera. Below left: *The Cygnus* nears the black hole and, below right, begins to break itself apart.





DISNEY'S SPACE ODDITY

NASA and King Arthur's court collide in a new tale of widescreen time travel.

By CHARLES BOGLE

This Christmas, Walt Disney Studios will be tackling the realm of science speculation rather somberly in their \$17.5 million opus *The Black Hole*.

During the summer months, however, Disney denizens will be presenting a somewhat lighter approach to science fiction in *Unidentified Flying Oddball*; a slightly out-of-whack tale of time travel.

The film stars Dennis Dugan (TV's *Richie Brockelman, Private Eye*) as space engineer Tom Trimble, an unassuming chap who unwittingly becomes both a time traveler and a historical hero before the film's conclusion. Tom and his lookalike robot, Hermes, are accidentally sent reeling into relativistic speed after lightning strikes their spacecraft. The shuttle craft spins dizzily out of control. When it finally re-enters the Earth's atmosphere, it alights in the green countryside of sixth century England, a country ruled by King Arthur and his knights.

Spacesuit-clad Tom is discovered by a fair young maiden, Alisande (Sheila White), who believes she has run across a monster. (To make matters even more interesting, Alisande carries around a gander which she believes to be her father...sent into goosedom by Merlin the magician.) Sir Mordred (Jim Dale) and his page, Clarence (Rodney Bewes), appear on the scene and take the monster back to Camelot.

Meanwhile, back at the castle, Merlin (Ron Moody) secretly plots with Mordred in a land-grabbing scheme that will lead to King Arthur's (Kenneth More) downfall. Tom's appearance before the assembly causes great concern and the monster, as he is called, is scheduled to burn at the stake. Fortunately, his inflated, air-conditioned suit saves him and he is able to walk through the flames much to the mystification of local spectators.



Love conquers all... even through a plastic space helmet in this tale of time travel.


Tom's invulnerability infuriates the power-mad Mordred who challenges him to a duel. Tom once again relies on NASA know-how. He magnetizes Mordred's sword. Every piece of metal in sight attaches itself to the knight's blade and the weight topples Mordred off the castle wall.

With enemies already made, Tom discovers the plot against Arthur and, using such

technological wonders as his robot, laser gun, Moon rover and jet rocket seat, attempts to quell the rebellion. During his various assaults on the senses of sixth century soldiers, he also attempts to find a way to get back into his own time.

Scripted by Don Tait, *Unidentified Flying Oddball* is very loosely based on Mark Twain's *A Connecticut Yankee in King Arthur's Court*. Produced by Ron Miller and directed by Russ Mayberry, the movie was filmed, in part, in the 11th century fortress of Ainswick Castle in the northeast part of England. NASA-inspired inflatable space suits were designed by Olinka Horne, a London-based space garb specialist. Cliff Culley supervised special photographic effects.

Culley and teammate Ron Ballinger did their homework in space science and came up with Hermes, a robot capable of losing his head and an arm in a jousting scene while still remaining mobile, a jet-pack to fly the contemporary astronaut high above battle encampments, a 25-foot long space shuttle with a retractable ramp and a compact four-foot Moon rover that expands to seven feet, with various screens, a solar disc and a large hydraulic arm that operates on cue.

Additional movie magic by Merlin. 

Trimble (Dennis Dugan) and his look-alike robot are sent tumbling through time and space.



Above left: Astronaut Tom Trimble takes to the air in his rocket chair in order to stop a Middle Ages revolt. Below left: The good ship *Stardust* leaves both the Earth and the past behind in the film's final few moments.

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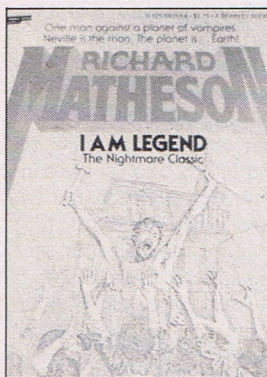
Things That Go Bump in the Universe

Matheson Revival

A number of young SF writers have lately run for their literary lives by noisily declaring their departure from the SF ghetto. Richard Matheson evidently doesn't understand that science fiction writers can't be successful. He's demonstrated a sure path to life in the fast lane—a solid reputation built on years of brilliantly frightening science fiction. Though largely unheralded, Matheson's work, if not his name, is familiar to everyone. Among his many credits are the celluloid classics *The Incredible Shrinking Man*, *The Haunting of Hell House*, *Duel*, a startling episode of *Star Trek* and multiple journeys into *The Twilight Zone*. And recently, when the TV execs were looking for someone to script Ray Bradbury's *Martian Chronicles*, the task quite naturally fell to Mr. Matheson.

Matheson is so much preoccupied with his film and television commitments that he's rarely seen in print these days. Fortunately for us paper junkies, Berkley has unearthed some of his earlier efforts and put them back in circulation.

I Am Legend (\$1.75 in paperback from Berkley), written in 1954, was Matheson's first novel and immediately established him as one of SF's foremost storytellers. This



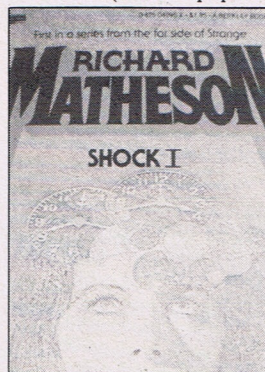
nightmare vision of the 1970s pits the last human of Earth against a world full of plague-spawned vampires. If this sounds familiar, you may have seen *The Omega Man*, a movie version of this story featuring Charlton Heston, or *The Last Man On Earth*, an earlier adaption starring Vincent Price. Neither film does justice to Matheson's chilling tale.

Robert Neville is the last living human. Every night he watches vampires who were once his neighbors trying to smash their way into his house and suck his blood. Every day he cruises through town, stakes in hand, dispatching his friends in traditional fashion. Although this vampirism is the result of a mysterious post-holocaust plague, the traditional defenses still work—garlic and crosses hold the creatures at bay and a stake through the heart turns them into a cloud of dust.

Matheson mixes myth and mutation in a terrifying brew that takes Neville to the edge of madness, then back to a peculiar understanding of this new race that rules the

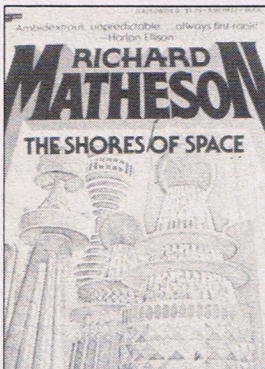
Earth—and his role as their monster, their bogey man. This hard-boiled horror story savagely twists the heroic vampire-killer's traditional role, and the result is sure to make you shiver.

Shock I (\$1.95 in paperback from Berkley)



is the first in a series of Matheson short story collections. It gathers 13 stories that should be read with all the lights on. Strange people, places and things abound in this world where small towns feed their founding fathers the flesh of travelers who get caught in their speed trap (that'll teach you to drive 55 mph), where you can still get phone calls from the not-so-dear departed, and where the much-touted California lifestyle becomes an epidemic that has orange groves popping up in Nebraska corn fields and midwestern housewives donning tennis dresses and fur coats for a drive into Hollywood.

In **The Shores of Space** (\$1.75 in paperback from Berkley) you'll find two of Matheson's stories that made the transition to video. "Steel," the evocative story of a stubborn



Irishman who stands in for his broken-down robot boxer against the best robot money can buy, became a bleak *Twilight Zone* episode that brought home the cost of human obsolescence. "Trespass," which tells of an alien exploring Earth from the safety of a woman's womb, became a TV thriller (*The Stranger Within*) not recommended for expectant parents. Matheson goes on to demonstrate that these two stories scarcely define the outer limits of his imagination as he introduces the reader to some of his weirder acquaintances. For example, in "Blood Son," you meet a boy-child whose first word is "death" and whose only ambition is to be a vampire. Or at "The Funeral," when Dracula brings in his best friends to see him properly laid to rest, we see the undertaker discover a whole new class of

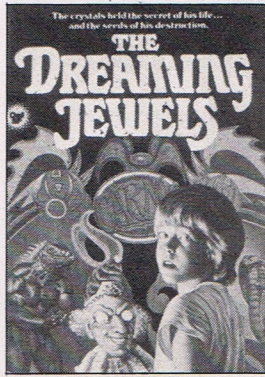
client and ceremony.

These three books taunt, terrify and tickle. Although none of the stories are less than 20 years old, age hasn't dulled any of their strange edges. Matheson confronts ordinary people with extraordinary circumstances and the result is breathtaking. If you want cold hard shocks or a few chilly giggles, you can't do better than these compelling stories.

SF Dreamer

Theodore Sturgeon is science fiction's short story king with a baker's dozen of collections available to back up the claim. In the 40 years since his first story appeared in *As-tounding*, he's filled hundreds of shorts with some of the most fantastic planets and memorable people in the genre. Sometimes, this magnificent deluge threatens to overshadow the fact that he's also written at least two of the genre's must-read novels—*More Than Human* and *The Dreaming Jewels*. The latter, after languishing under a publisher-imposed sky fie title, *Synthetic Man*, has just been rescued and returned to print.

In **The Dreaming Jewels** (\$1.75 in paperback from Dell) Horthy Bluett flees his evil stepfather to run away with the Monetre Carnival. Admittedly, this was an old line even in



1950, the year this story first appeared, but in Sturgeon's hands this youngster's odyssey offers the reader a fresh look at what it means to be human.

Before he joins the carnival, Horthy's only friend is his jewel-eyed jack-in-the-box. This ugly toy is Horthy's only friend, possession and the one thing he literally cannot live without—he hurts if the toy is being damaged and he gets sick if it's too far away. Along the midway, this changes. Here he's accepted by the freaks as wholeheartedly as they're rejected by the world. In this haven, Horthy discovers love, music and knowledge. Only Zena, the lovely midget, understands that both Horthy and Maneater, the carny owner, are ruled by the dreaming jewels, and even she can't prevent their final confrontation.

Sturgeon's blend of loving imagination, a touch of the strange and beautifully realized characters creates an unforgettable world where stones dream and human is more a matter of attitude than shape and size. This is

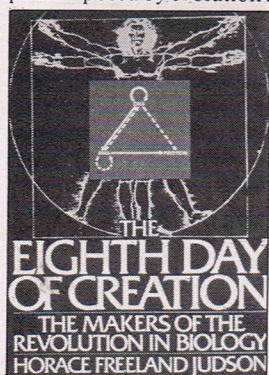
one of Sturgeon's most moving works and that means it should not be missed.

Bio-Discoveries

The 20th century is radically changing our perception of the universe. Scientists are looking further, theorizing faster and changing more of the rules than ever before. Where 19th century scientists could point confidently at their model of the atom—a simple nucleus surrounded by a cloud of electrons—and say “we can go no further,” today's researchers are mapping the subatomic realms of fermions, bosons, quarks and a legion of fractious particles with no end of possible configurations, problems and possibilities. And that's only in physics.

All the sciences are growing this wildly as we move toward the 21st century, and as these fields grow more complex and obscure, laymen grow more and more confused. This confusion is bringing forth a bounty of increasingly sophisticated popular science books that refrain from bombarding the reader with formulae, while giving a sense of the beauty of the science along with an understanding of the facts of the matter.

One of the most rapidly evolving sciences of the last half of the century is biochemistry, a branch of biology that studies the chemical compounds and processes that occur in living organisms. The remarkable story of this science's beginnings and the people involved unfolds in Horace Freeland Judson's **The Eighth Day of Creation** (\$15.95 in hardback from Simon & Schuster). Here the discoverers are enlisted to explain their solutions to the puzzles posed by evolution and reproduction.



More than a hundred interviews, including 20 with Nobel Prize winners, are included in this thoroughly engrossing tome. If you can imagine a room filled with the world's top biologists and a knowledgeable reporter who keeps them talking candidly about their work and their co-workers, you can understand this book's appeal.

The Eighth Day of Creation chronicles three of the most important and basic advances in modern biology—the decoding of DNA by James Watson and Francis Crick, the uncovering of how DNA is used to manufacture proteins and how this determines their function, and finally, the discovery of hemoglobin, the protein that picks up oxygen in the lungs and delivers it to the tissues where it exchanges the oxygen for carbon dioxide—and then starts the whole

trip over again.

Judson traces the history of each idea from scientist to scientist, focusing on each new bit of evidence and many of the crucial disagreements. He reveals doubts, dead ends, chicanery and frustration, and in the process, offers the reader a sense of the evolution of ideas and a chance to share the scientists' joy when they (and he) finally succeed in putting the whole picture together.

With his incisive interviews and slightly irreverent descriptions, Judson vividly sketches the participants in this scientific mystery story. Mostly young, they approach their work almost as a manic game, even describing their discoveries in playful fashion: “DNA was like a child's toy, all built in this wonderful way that you could explain so that a five-year-old could understand.” The Watson-Crick structure for DNA is an elegantly simple twisted ladder and its simplicity was the greatest shock to the scientists, just as the warmth of this book and the people it contains may be to the reader.

Though this is definitely *not* an easy read, it is worth the time and effort needed, both for the science and the sheer excellence of Judson's writing and reporting. These people and their games changed the world. And since this is recent history, many of the people you read about may have more surprises in store for all of us. So if you want to know what to expect, this is a good place to start catching up.

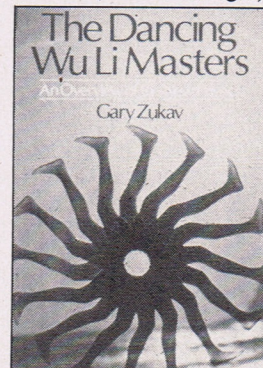
Fringe Physics

Physicists' problems differ greatly from those of biologists; while a biologist's work may be complicated, it's rarely bizarre. But as physicists deal with smaller and smaller particles and increasingly subtle effects, they get to the point where they don't know if they're measuring something or creating it. They end up asking questions like, “Did these particles exist before we set up an experiment to measure them?” (And we thought laymen were confused.)

Gary Zukav sets out to make all this clear in **The Dancing Wu Li Masters** (\$12.95 in hardcover from William Morrow). Wu Li is Chinese for patterns of organic energy—physics. It also means “my way,” “nonsense,” “I clutch my ideas” and “enlightenment,” depending on how you say it. Zukav uses these variants as a framework for a mind-expanding jaunt into the wonderful world of quantum mechanics and relativity.

He manages this painless explication of physics by moving the reader into increasingly complex realms of physics without any off-putting equations or “scientific method mind-set.” Presenting the classic proofs of quantum mechanics and relativity as a series of anecdotes, he starts with the basics—waves, frequency, atoms—and slides into the complexities of relativity using elevators and cigarette-smoking astronauts to demonstrate

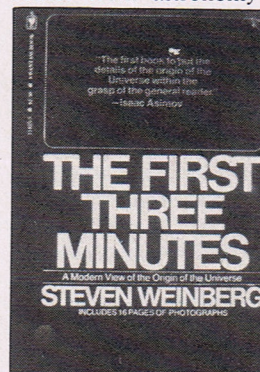
the fixed velocity of light and the changing aspects of time. Beyond this, he ventures far into particle physics to demonstrate where the next frontier lies—Bell's theorem and superluminal (faster-than-light) communication.



zen, Tai Chi and the oneness of all than physics, and that can be more distracting than any amount of scientific method. As an anecdotal introduction to basic physics and quantum mechanics, this book makes the complex seem easy, but in the higher realms, Zukav seems to be playing with some attractive but untested theories. His willingness to teach interesting but untested science alongside proven theory (as well as theory can be proved) may have the reader finishing the book more confused than when he began, though perhaps still less confused than your average physicist.

Primal Universe

Astronomers are time travelers, and astronomer/physicist Steven Weinberg invites you on a trip to yesteryear, all the way back to **The First Three Minutes** (\$2.50 in paperback from Bantam). This minute-by-minute account of the origin of the universe comes from astronomy's new “standard



model” of the universe. The standard model holds that the universe originated in a cataclysmic explosion, a big bang, and it's called standard because most astronomers agree. This is indistinct contrast

with the days before there was evidence supporting this theory; then there were almost as many explanations as astronomers. Laymen and scientists alike greet the end of the multiple-choice universe with sighs of relief.

Weinberg begins with a quick review of the days when scientists knew that the universe was expanding, but didn't know why. He slows down for a close look at 1965 and a puzzled pair of Bell Laboratory radio astron-

omers who can't get their radio dish antenna to stop picking up a strange noise no matter where they point it. The noise that's giving them such trouble is the first evidence of the big bang—heat left over from the primal explosion. This short history establishes a detailed framework that prepares the reader for the trip back in time.

This trip can't go *all* the way back. "When we go back to earlier and earlier times. . . . our ignorance of microscopic physics obscures our view of the very beginning," Weinberg explains. But the view is spectacular

nonetheless. Starting .01 second after the blast, the cosmic soup is 100,000 million degrees Kelvin, cooling and expanding at a prodigious rate. Weinberg proceeds through his recipe for the beginning of the universe, taking us from an undifferentiated soup of matter and radiation to the creation of the first elements. After this point, "the universe will go on expanding and cooling, but nothing of interest will occur for 700,000 years." Since that's the case, the writer tries to give a glimpse of what lies behind the veil of that crucial first .01 second and beyond that

to the next logical question—how does the universe end?

This is no overview of modern astronomy or astrophysics. *The First Three Minutes* closely examines the bang in the big bang, and this presentation is exciting *because* of its limits. Weinberg lays out the details of the primordial cosmic explosion and the evidence that points to it in clear and logical order, so that the general reader with no special knowledge of physics or mathematics can grasp one of the most remarkable theories of contemporary science.

Books in Brief

A Perfect Vacuum: Perfect Reviews of Nonexistent Books by Stanislaw Lem (\$8.95 in hardcover from Harcourt Brace Jovanovich). A perfect vacuum is one way to label much of today's literary criticism, especially in the areas of science fiction and popular pseudo-religious-scientific-good-vibesish social movements. Book reviewers have a tendency to get overly cerebral in these areas and become as important as the book itself in the final article. Polish SF writer Stanislaw Lem takes a well deserved swipe at both current literary trends and schools of literary criticism in *A Perfect Vacuum*; a collection of reviews of nonexistent books that are so ridiculous they could be real. Marcel Coscat's *Les Robinsonades* is an appropriately over-intellectualized re-hash of *Robinson Crusoe* wherein the marooned main character actually populates his Island by imagining humans. Being a decent sort, he starts with his own butler. Later, when labor disputes begin, he adds to the population. ("All this," says the pontificating reviewer, "nearly 170 pages—not counting the epilogue!—produces the impression that either Robinson abandoned his original plans or the author himself lost his way in the book.") Also on hand for review is Patrick Hannahan's *Gigamesh* (if James Joyce could take on *Ulysses*, the author reasons, why can't someone go back even farther and adapt the Babylonian epic?). Says the critic in his cryptic review: "To continue, *Gigamesh* is a GIGAntic MESS; the hero is in a mess indeed, one hell of a mess, with a death sentence hanging over his head. . . ." And so it goes, brainy pun after pun, with Lem commenting on *The New Cosmology*, *Being Inc.*, *U-Write-It* and other titles so off-the-wall that you'll probably see them in print before month's end. (Ed Naha)

Crompton Divided by Robert Sheckley (\$8.95 in hardcover from Holt Rhinehart Winston). Allistair Crompton has a problem. In the enviable position of Chief Tester for Psychosmell, Inc., he is a well respected citizen. Secretly, however, he is miserable. He

feels he is only one-third his true self which, in essence, is true. He was separated at birth from two conflicting sides of his personality. The other two facets have been housed in other host bodies and placed on different sleezoid planets to live out their (un)natural lives. Middle-aged Crompton, an incredible twit, decides to take a walk on the wild side and reintegrate himself with his two other selves; a dangerous and illegal task at his age. He tracks down Loomis, a two-bit hedonist, and Stack, a callous killer, and a family reunion occurs that will send most Freudians into a state of terminal psycho-babble. As usual, author Sheckley manages to take a basic odyssey tale and instill it with a tongue-in-cheek vitality not often seen in contemporary SF literature. (Ed Naha)

Dome Builder's Handbook No. 2 by William Yarnell (\$6.95 in paperback from Running Press). If you've been considering alternate living quarters, this is one book you'll probably want to consult. The *Handbook* deals with the geodesic ("Earth dividing") dome, a structurally and environmentally viable type of habitation that first came into popularity when it was introduced by Buckminster Fuller in the 1950s. This interesting structure is actually made up of complex networks of triangles (the triangle being the most stable of all geometric forms) that form a stress-resistant, circular-shaped building which is, according to the author, heat efficient and relatively easy to construct.

William Yarnell takes his readers through the process of planning and building a dome; first giving a short history, then discussing the factors to take into consideration when planning to invest in a dome (including such frustrating but ever-present realities as building codes and contractors) and finally giving a thorough insight into the building process, including short descriptions of several dome manufacturers. To illustrate the text, the book is well-stocked with both black-and-white and color photographs. (Barbara Krasnoff)

The Accident by Hans Heinrich Ziemann (\$10.95 in hardcover from St. Martins). Published a year ago in Germany, this novel had the good or bad fortune, depending on your sense of irony, to make an appearance stateside within weeks of the Three Mile Island disaster. Basically a suspense tale, *The Accident* concerns itself with the successful attempt of a lone crazy in sabotaging Helios, the biggest atomic power plant in the world. While its plot contrivances are pretty standard, the book takes a brilliantly uncompromising view of the risks involved in such an "accident." The final third of the novel is one of the grimmest accounts of a disaster in-the-making of nuclear origin that one can imagine. Ziemann does not opt for the classically American "alls well that ends well" finish and his novel ends on a particularly jarring note; a note underscored by our nation's current inability to come to grips with both the nuclear industry and the hazards involved with nuclear power. (Ed Naha)

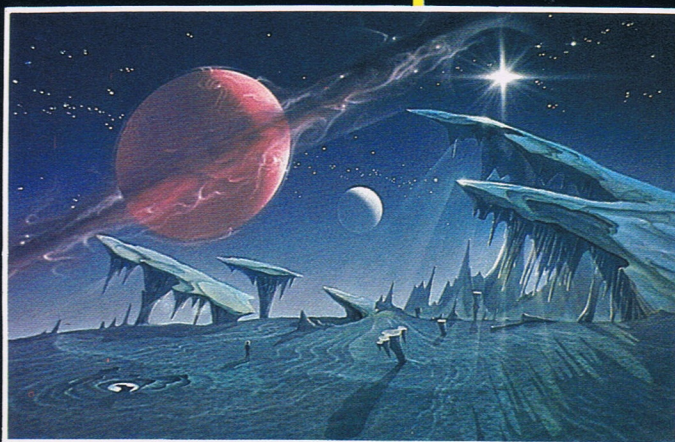
Dimension of Miracles by Robert Sheckley (\$1.95 in paperback from Ace). When Thomas Carmody, a typical New York City-type Earth creature, finds that he has won the Prize in an intergalactic sweepstakes, his first impulse is to accept it. After all, how many humans get the chance to visit the Galactic Center, not to mention collect such an important Prize? Unfortunately for Carmody, in accepting the Prize (a chameleon creature with a gift for gab and no discernible use) he has become stranded without the proper coordinates necessary to find his way back to Earth (the When and Which are just as important as the Where).

Author Sheckley deftly blends satire with science fiction as he takes his hero through several alien, yet very recognizable, worlds in search of Earth. Carmody's encounters with various alien intelligences, and the weird, convoluted avenues of logic that he must travel in order to convince them to help him, is the main plot line of this fascinating novel. (Barbara Krasnoff)

Thompson

Jim Thompson's paintings of otherworldly scenery are more than simply beautiful works of art. In addition, they are representations of the alien cultures and environments that the human race may one day encounter in its travels among the stars. According to Thompson, the subjects of his spacescapes are, "fiction, of course, but only because of a lack of information on the elements. They are meant to depict the study of a science dealing with natural and very real possibilities of extraterrestrial origins. My endeavor is more toward the search for humanly inhabitable environments and extraterrestrial intelligence." For example, the painting shown here, entitled "Mid-Watch Break," portrays a "worker on a subterranean project on this particular planet. He is taking a break to come out, stretch his legs and look around."

Thompson, a former art director with an industrial advertising



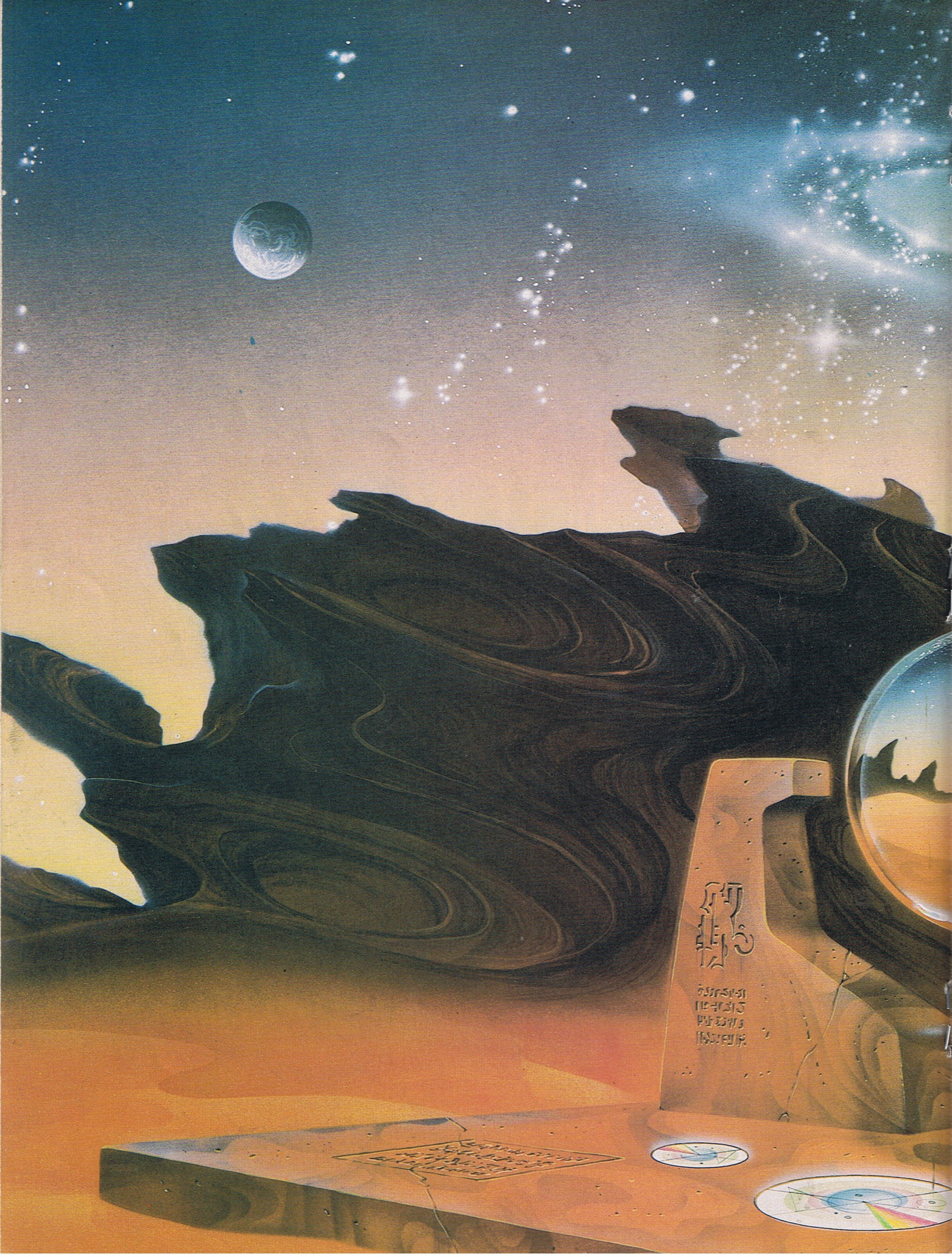
agency, considers the airbrush (a spray nozzle attached to an air compressor) one of his most useful aids. With it, he creates the fine detail and textured effects found in his work, and continually experiments with it as an artistic tool. A native of Louisiana, he is also experienced in photography and lithography, and has recently expanded his interests to include astronomy and hot air ballooning.

Of the centerfold, "Token of

Intelligence," he says, "Very long ago, thousands of years ago, this edifice was left by a superior intelligence for us to discover, to tell us something about this particular solar system. The marker exhibits an arrangement of a disc and an inscription that can be deciphered to indicate the life form that left the structure. On the disc is laid a mechanical representation of the planets and stars you see in the background. The device monitors the movements

and makes adjustments for any irregularity of the bodies in this solar system. It represents the pinnacle of a shaft which sinks into the planet for several miles and controls the operation of tremendously powerful and complex machinery. It is something for us to decipher—a puzzle left for us to solve."

For Jim Thompson, his space art is a means to express his philosophy about life in a continually expanding universe. "I believe that, even here in our world, there are endless varieties of strange beauty that might impress an extraterrestrial pilgrim. It seems phenomenal that so much knowledge has accumulated since the turn of this century and sad that so little wisdom accompanies it. If the answer to our perfection is in the stars, then I don't think we will know it until wisdom and knowledge are efficiently balanced and the real significance of the human presence is established." F





STAR EMPIRES

A science fact look at
the science fiction ideas
of galactic civilization
and interstellar conquest.

By MICHAEL A. G. MICHAUD



The clash of interstellar empires has been a staple of science fiction epics for many years. *Star Trek* pitted the Federation against the warlike Klingons and Romulans; the starship *Enterprise* had to be cautious about crossing invisible borders subdividing the Milky Way galaxy. In *Star Wars*, rebels fought a tyrannical empire whose power was symbolized by the giant Death Star.

Setting up such imaginary empires allows writers to create contrast, tension and conflict, as well as make points about social and political events on Earth. But are such empires really possible? Or are they simply extrapolations into the future, based on Earth empires of the past?

While it is impossible to prove the existence or nonexistence of galaxy-spanning empires from our present vantage point in time and space, let's take a look at some of the conditions that point to an answer to that intriguing question.

Life in the Galaxies

Most galaxies are elliptical, slowly rotating globular or football-shaped swarms of older stars. Some astronomers believe that elliptical galaxies are unlikely to produce life because most of their stars evolved early in cosmic history, and contain few of the heavier and more complex elements needed for biochemistry, such as iron, oxygen, sulphur, and carbon. Ellipticals also show little evidence of the gas and dust clouds which would be enriched in heavier elements formed in older stars and thrown off during their death throes, and they lack the compression zones that cause these clouds to recondense into new generations of stars.

Spirals, the other main type of galaxy, appear to be more likely breeding grounds for life. Each typical spiral is composed of a central mass or nucleus, a flattened disk and a thin globular halo around the outside. The nucleus and the halo remind us of elliptical galaxies; they too are composed of older stars. It almost looks as if spirals started out as ellipticals, but rotated rapidly enough to cause many stars—and most of the galaxy's unincorporated gas and dust—to concentrate into a disk. If you look at a big spiral galaxy edge on, you can see a dark line of dust around the rim, blocking out the light of the stars. Our own Milky Way is a large spiral galaxy, a disk rich in gas and dust.

Years ago, science fiction writers dreamed of vast empires in the hubs of spiral galaxies, where stars are more densely clustered. Stars in the outer parts of galactic disks, like our Sun, were considered to be in the galactic boondocks. But those dreams have faded as astronomers have found galactic nuclei to be places of violence, shaken by titanic explosions, rippled by shock waves that race outward from the center. The great central empire of the Milky Way probably never was; we should be glad that we live out where things are dull.

Out in the disks of spiral galaxies, there are compression zones that cause condensations

and rarefactions in the interstellar clouds of gas and dust. Those shock fronts shape the arms we see in a face-on picture of a spiral. The arms are bright because they are the regions of the most active star formation. Generational change among stars seems most rapid in the disk, concentrating heavier elements in individual stars and their planets. Here, life is more likely to evolve.

The disks of spiral galaxies are where the action is. That is where intelligent beings are most likely to have the raw materials necessary for industry, transportation—and war. That is where star empires, if there are any, most probably begin.

Heavy Metal

Different kinds of civilizations might develop from different generations of stars in our galaxy. Old stars with few heavy elements might produce non-technological civilizations, or perhaps societies with no metal technologies. Later generations of stars might have planets whose surfaces were rich in heavier, harder materials, such as iron. This

Once founded,
star colonies would
change the conditions
for interstellar flight
by providing civilized
destinations... spreading
the species through the
disk of the galaxy like
ripples on a pond.

factor is essential, since some of the heaviest and rarest materials, like uranium, are necessary for nuclear fission.

The real powers in a spiral galaxy might evolve from later generations of stars, which would encourage the evolution of hard technologies. Technological species (if they do not destroy themselves) would be the most likely to reshape their environments to their designs, and to dominate their planets. Our Sun, interestingly, is probably a third generation star, whose inner planets are well endowed with heavier elements.

Many, perhaps most, intelligent species may never expand beyond their planetary biospheres. Some may not be able to see other planets or stars, because of a heavy, Venus-like cloud cover; they may not even think about an external universe. Some may lack the technology for spaceflight. Others may have no nearby destinations, like our Moon, to lure them outward. (Would we have a space program today if our nearest solar system neighbor, other than the Sun, were Pluto?) Still others may see the external universe but suffer from what Arthur C. Clarke has called a failure of imagination or, if they do see the opportunity, a failure of nerve.

But a few civilizations might adopt extra-planetary visions of their futures. They may

expand outward into their solar systems, colonizing other worlds, or building artificial habitats in space. They may engage in macro-engineering of their environments, altering planetary atmospheres and climates, mining moons and asteroids, moving the bodies of their systems to more useful locations. Physicist Freeman Dyson has suggested that an intelligent species might rearrange the matter of its solar system into a shell of material around its star to make more efficient use of stellar energy. That shell, referred to as a Dyson sphere, might be for all practical purposes a closed universe for the intelligences inside it, who might regard their achievement as a final stage—until their star became unstable, as all stars eventually do.

The Outleap

What happens when an expanding intelligent species reaches the edge of its solar system? If it is in a typical region of our galaxy's disk, the next star would be, on the average, several light years away. Looking across that interstellar gulf, many intelligent beings might give up and turn inward, contenting themselves with a solar system civilization.

But a few societies may be motivated to leap outward toward the stars. They may first send unmanned probes to survey target systems and report back by radio. If attractive destinations were found—habitable planets or plentiful raw materials for space colonies—the expanding civilization might send out interstellar arks loaded with colonists. Once founded, star colonies would change the conditions for interstellar flight by providing civilized destinations. Eventually, the colonies might be able to send out their own groups of colonists, spreading the species through the disk of the galaxy like ripples on a pond.

The Light Barrier

Scientists believe that no physical object can be accelerated to the speed of light or beyond it. Unless an expanding civilization could find some way through or around this barrier, star colonies would have to be self-sufficient. A resupply mission—or even a radio message—would take years to reach a colony. The needs of survival in a different, faraway environment would encourage ideas of independence. Sooner or later, every colonizing species may face the problem of independence movements, and even civil war.

Here we encounter the fundamental problem of running an interstellar empire: time. News of a revolt would take years to reach the imperial capital, and military forces—like the storm troopers of *Star Wars*—would take more years to strike back at the rebels, who would use the time to prepare.

Determined rulers might develop techniques to ensure loyalty, such as psychological conditioning, or even genetically implanted responses. But even these measures might erode over time as evolution proceeded separately in different environments. The final result might be a scattering of star states, sharing nothing but a fading memory of a

common origin. If separation from the home system continued long enough, there might even be biological divergence from the original colonizing species.

One event might bring together a species dispersed among the stars: contact with another civilization. That contact might take place first through indirect means, such as interstellar radio. But if one or both civilizations were expanding, direct contact eventually might occur. That contact might be peaceful and benign, as in *Close Encounters of the Third Kind*. Or it might be disastrous, resulting in the destruction of the weaker species by the more powerful, or a terrible conflict between equals.

Interstellar Conflict

If many intelligent species exist in this galaxy, they almost certainly evolved to intelligence and civilization at different times. That means that the creation of interstellar empires—if there are any—began at different times in different parts of the galaxy. As each sphere of expansion grows, it may be more powerful than the non-expanding civilizations it encounters. Contact is likely to be between unequals; conflict, if there is any, probably would be short-lived. Even a hundred years difference in technological development could be decisive. The fate of weaker civilizations, then, may depend not on their bravery or their science and technology, but on the ethics of the stronger.

The real star wars may occur in the less likely event of contact between expanding civilizations with relatively similar levels of technological power. Then star admirals might deploy fleets of battlecruisers, manipulating them in three dimensions. Rival powers might negotiate borders and no-creaturelands in space and alliances might be formed against expansive powers.

This suggests that the survivors of interstellar conflicts might be the most aggressive, technologically powerful societies. Freeman Dyson has warned that we may first encounter a species whose technology is out of control, a sort of technological cancer spreading through the galaxy.

In the past few years, war game companies have attempted to simulate interstellar conflict on playing boards. They have been forced to assume that star-faring species will find some way around the light velocity barrier to rapid interstellar travel. In "Starforce Alpha Centauri," leaps between stars are made psionically—by power of mind. "Outreach" envisions competitive expansions through the Milky Way, while other games depict titanic struggles for the control of entire galaxies.

Where Are They?

Considering the age of the universe—15 to 20 billion years—it would not be surprising if some civilizations evolved long before ours, perhaps even before life appeared on Earth over three billion years ago. If some of those Ancients chose to expand, and continued, they eventually could occupy whole galaxies. This makes us wonder if alien starships have visited this planet at some time in the past, or

if we can see the macroengineering works of these civilizations. Since we have found no convincing evidence of extraterrestrials, we must ask: where are they?

One possible explanation is that evolutions to life and intelligence are exceedingly rare, occurring perhaps only once in a galaxy's history. Another is that technological species destroy themselves before they embark on interstellar expansion. Or perhaps they decide that expansion is not worth the effort, and remain on their own planets or in their own solar systems by choice. Civilizations which do not expand and which succeed in establishing empires may flourish on a vast scale, perhaps for millennia, only to collapse and decline into barbarism. The lifetimes of cultural and political entities are short compared to the time scales of cosmic and biological evolution.

Successful empires may choose to avoid contact with minor civilizations like our own, perhaps adhering to a code of ethics which forbids interference with an inferior culture. According to the "zoo theory," more advanced civilizations may have set off our part

It may be that we cannot see the greatest of the star empires because it is on the other side of the crowded, violent nucleus, slowly expanding around it toward our side of the galaxy.

of the galaxy as a natural preserve, within which primitive societies are left undisturbed, possibly so that interstellar anthropologists can study them.

A great empire might be so far advanced technologically that we would not recognize its presence in what we see in the universe. Carl Sagan once observed that an ant walking beside a suburban swimming pool may be unaware of the existence of a superior civilization all around him.

The fact that we have not detected any empires may mean that we are alone, that we are the only technological civilization now existing in the galaxy, or that we are the first to emerge from galactic evolution. Or it may mean that we cannot see the greatest of the star empires because it is on the other side of the crowded, violent nucleus, slowly expanding around it toward our side of the galaxy.

When we look up at the constellation Andromeda in a clear night sky, we can just make out a fuzzy patch of light known to astronomers as M31. Powerful telescopes show it to be a large spiral galaxy similar to our own, with a nucleus, five arms and clouds of gas and dust giving birth to new stars. Somewhere in that vast pinwheel of hundreds of billions of stars, civilizations may have been born, some to expand, to clash in a flare

of energies, to die or conquer. Somewhere in that galaxy, alien beings may be studying the Milky Way, looking for other empires.

The Human Example

We are newcomers to the community of technological civilizations that may exist in our galaxy. Only since World War II have we acquired the means to search for radio signals at interstellar distances, and to escape the limits of the Earth through spaceflight.

Our spaceflight capabilities and improving perceptions of the solar system around us have given new impetus to the idea that humanity should expand beyond Earth, establishing colonies in space or on other natural worlds, using the resources of the solar system to fuel extraterrestrial industries. Princeton physicist Gerard O'Neill and his colleagues have designed large space colonies constructed of rock from the Moon. Carl Sagan and other scientists have suggested ways of "terraforming" Mars and Venus, making them habitable for humans.

Carrying out such ideas would begin the human expansion into the universe. Within a century, humans could colonize the solar system, perhaps even reaching out beyond the orbit of Pluto to create habitats in the "Oort cloud" of comet nuclei that is the outer edge of the Sun's realm. Then humanity would face the choice: to cross the interstellar gulf, founding new colonies near other stars, or to remain bound to the Sun.

Our descendants may shrink from the challenge of interstellar flight, concluding that the solar system should be the limit of human ambition, and accepting the end of humanity when the Sun dies a few billion years from now. Or they may begin the out-leap, sprinkling our part of the galaxy with human colonies. Scientists and engineers from the British Interplanetary Society and the Jet Propulsion Laboratory already have done design studies of interstellar probes. If the humans of that future colonial age find political and technological means to hold their expanding realm together, they may create a human empire in the stars.

This would realize an old science fiction dream. Prominent science fiction publisher Donald Wollheim has pointed out that there is a consensus among science fiction writers that the stages of future history are likely to include the colonization of other star systems and the formation of a human galactic empire, which might collapse and be reborn.

That empire may be wise and tolerant, caring for the other evolutions to life it may find, exercising restraint in its dealings with other intelligences. Or it may be arrogant and brutal, wiping out other forms of life, squashing potential rivals for galactic dominance. Humanity might become Dyson's "technological cancer" spreading through the galaxy.

We cannot foresee the ethics of the future. But we must hope that imperial power on an interstellar scale is accompanied by higher ethical standards than empires have observed on Earth; because someday, expanding humanity may meet an empire more powerful than its own.

Ecology—Preserving Future Options

Ecology, ecologists, ecosystems.... These eco-roots seem to be confusing a lot of people these days. Since they crept into the vocabulary during the environmental consciousness-raising of the '70s, these words have come to represent a broad range of ideas about how to cope with Earth's incredible diversity of resources.

A recent guest essay in *The New York Times* illustrates the misunderstanding. "Ecology mandates that all species be preserved in their present state," the author complains, "and cancels completely the commandment of survival only for the fittest...." Nothing could be further from the realities of ecology.

Ecology is, basically, the science of the interaction of species and their environment. Because there are hundreds of such interactions, it has been broken down into *ecosystems*. Ecologists (who, like all of us, are part of an ecosystem) study the interplay; only recently has the term become fashionable for categorizing any "nature nut" or "animal lover."

Today, ecology is a fine science, abundant with theories on how it all comes together. But the concepts of ecology have been with us for centuries. Noah, with his ark, was an ecologist; Teddy Roosevelt, the founder of our national parks system, was one also. One of the most controversial ecologists in history was a young scientist aboard the *HMS Beagle*, Charles Darwin, whose hypotheses of natural selection and evolution are among the keystones of ecology.

Contrary to opinions like those expressed in the *Times* essay, ecologists wholeheartedly embrace Darwin's theory of "survival of the fittest." Too many people wrongly assume that ecologists want everything, from a three-inch snail darter to a 2,000-year-old Redwood forest, to stay just the way they are, forever. Rather, what the ecological movement—yes, it has become a movement—is apprehensive about is the most devastating evolutionary agent ever introduced—the human factor.

The extinction of species is an inevitable, biological fact. However, as Darwin surmised, the loss of species contributes to the rise of new or modified species; the presence of *homo sapiens* demonstrates the point.

Ecologists are concerned about the reckless rate at which these changes are occurring. Modern human society and the technology it has introduced to the environment has revolutionized natural selection. Human encroachment has dramatically accelerated the evolutionary cycle, leading to a completely unnatural—and dangerous—level of extinctions. The danger lies implicitly in the theory



Giant Redwoods: Another 2,000 years?

of evolution itself, that biological diversity is vital to the maintenance of life on this planet. The human factor is cutting back on the variety of life, leaving our present biological systems extremely vulnerable and thereby severely undercutting the advancement of our own species.

It is this human experimentation that ecologists are fearful of, and which has fueled the ecological movement. In a surprisingly short period of time, governments, private in-

terests and individuals have become aware of the need to protect our environment. This knowledge has spawned scores of programs and laws to curb pollution, preserve wildlife and conserve exhaustible resources, all setting the stage for a global ecological and social challenge.

Still, there is a great deal to be done in the way of ecosystem management and rethinking our future development. The continued assault on endangered and threatened species deserves immediate, worldwide attention. Crucial to this concept is the preservation of natural habitats; their loss is by far the most devastating contribution to wildlife destruction. Particular attention must be given to the developing nations who, in their struggle for survival, cannot perceive the needs of the flora and fauna, especially when it comes to putting food on the table. But their plight cannot become the reason for the further denuding of valuable, irreplaceable forestland or for animal poaching (done mostly to satisfy the greed of developed countries). It becomes the explicit responsibility—and moral obligation—of world leaders, both governmental and corporate, to meet the demands of expanding populations by establishing policies that address the critical survival of the environment.

The ideals of ecology go far beyond saving whales and eagles. It is the collective perpetuation of entire ecosystems that will guarantee the changes and growth of evolution. Ecologists clearly recognize the need for change. It is the wanton manner by which humanity and "progress" are exceeding the natural bounds of evolution, reducing our future options, that has ecologists worried. ▮



Endangered snail darter. To ensure its survival, a \$190-million power project was halted. The human challenge is to preserve biological diversity.

The Martian Chronicles: Making Fantasy a Reality

Mars.
The Red Planet.

The desolate fourth planet of the sun. This fall, NBC-TV will populate Mars' surface with some of the most famous characters and classic situations ever concocted within the realm of science fiction literature. Ray Bradbury's *The Martian Chronicles* is coming to television. Filmed as three consecutive two-hour telecasts, the series will visualize Bradbury's epic story of the colonization of Mars by Earthlings. Scripted by Richard Matheson, *Chronicles* stars Rock Hudson, Fritz Weaver, Darren McGavin, Roddy McDowall and Nicholas Hammond. And, aside from its length and movie star value, the show promises to be a totally unique excursion into small-screen science fiction.

"It's not science fiction in the traditional video sense," explains executive producer Charles Fries. "*The Martian Chronicles* is not *Battlestar Galactica*. It's not a comic strip thing with guys shooting at each other with ray guns every five minutes. It's a sociological concept piece, with hardware and science fiction involved."

The three-part mini-series will include practically all of the vignettes featured in the original book, tracing the efforts of humans both at colonizing Mars and coming to an understanding with the seemingly omniscient Martian race. Much of the drama which arises is quite philosophical in nature and, in television terms, that translates into difficulty.

Nicholas Hammond, who portrays Captain Black of the second Mars expedition, acknowledges the fact that the filming of the *Chronicles* was a challenge to all concerned. "Bradbury's work is a head trip," he states.

"It requires the use of the imagination. I think he is probably the most cerebral of all science fiction writers in that he leaves much of the drama up to his readers. He requires that you imagine what all these fantastic settings, landscapes and creatures really look like. Trying to convert one man's imagination into physical realities for the camera, however, was a real challenge. What do the Martians look like? Their weapons? How does a human react when communicating with a Martian? Realizing those realities was a problem, but one that was dealt with successfully. Our director, Michael Anderson, did a wonderful job of getting a total commitment from everyone involved. Nobody backed off from it. Nobody treated it like comic book science fiction. It was all dealt with realistically."

Director Anderson, a 30-year movie veteran responsible for such eye-boggling films as *Around the World In 80 Days*, *Logan's Run*, *The Dam Busters* and *The Quiller Memorandum*, readily concedes that the key to his approach to the classic Martian fantasy was, indeed, that of realism. "It was a total challenge to film," he says. "Ray Bradbury's book is more poetic, in a sense, than visual. The challenge was to try to keep the essence of Bradbury while still producing a storyline and imagery that was fluent and comprehensible."

"The first thing we had to figure out was how to handle a work that is essentially fantasy, almost modern mythology, in a realistic fashion. We tried to avoid the trap of making it so much of a science fiction outing, so far out that it would look like a comic strip."

"We avoided that approach. We're talking about a story that's happening 20 years from now. So, we took the theory that very little

had changed on Earth during that time in terms of clothes, amusements and lifestyle. That isn't as far fetched as it sounds. I still wear a pair of pants that I bought in the 1950s. We decided to make tomorrow's lifestyle an extension of today's."


"Bradbury's idea in the book is that, when people go up to Mars, they essentially recreate the same kind of mess that they have on Earth. This theme was prevalent, not only in our script, but in what we physically constructed on Mars. The Earth homes are modular, they look like Earth technology. One fellow wants a hot dog stand. He builds it. The priests want a fairly conventional church. They have it. And so on."

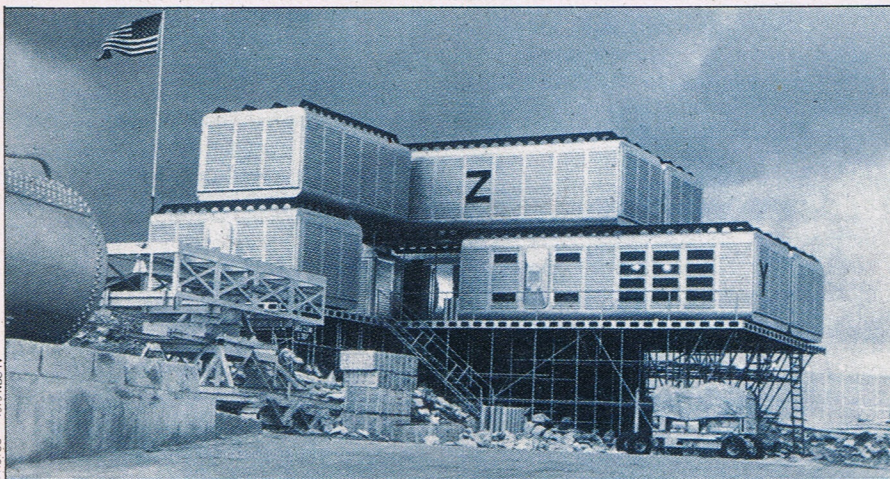
"We didn't make the weaponry all that strange, either. Everything is based on what we have now. Being on our Mars is a bit like being on Earth, although the terrain is certainly spacier and the Martian cities are very futuristic. The only real differences between the two planets is that of breathability. As Bradbury indicated in his book, we operated on the idea that by the year 2000 a method would have been found, perhaps in the guise of an injection, that would allow humans to breathe the thin Martian atmosphere for short periods of time. On our Mars, everything is as normal as possible... except for our Martians, of course."

The Martians' still top secret makeup designs, according to associate producer Charles M. Fries, will stun many SF novices in television land. "They do look rather otherworldly," the young producer says. "We wanted to create beings that were obviously from another planet but we wanted them to have grace, beauty and strength. We wanted them to symbolize a certain quality that mankind holds dear: honor, integrity. Yet, we had to make them visually different from humans. That's a tall order."

"We did a lot of experimentation on different looks and different approaches. The one we came up with took the basic human shape but added certain modifications." And what are those modifications? Fries won't say as yet but adds, "All I can reveal is that Ray Bradbury is very pleased with the results."

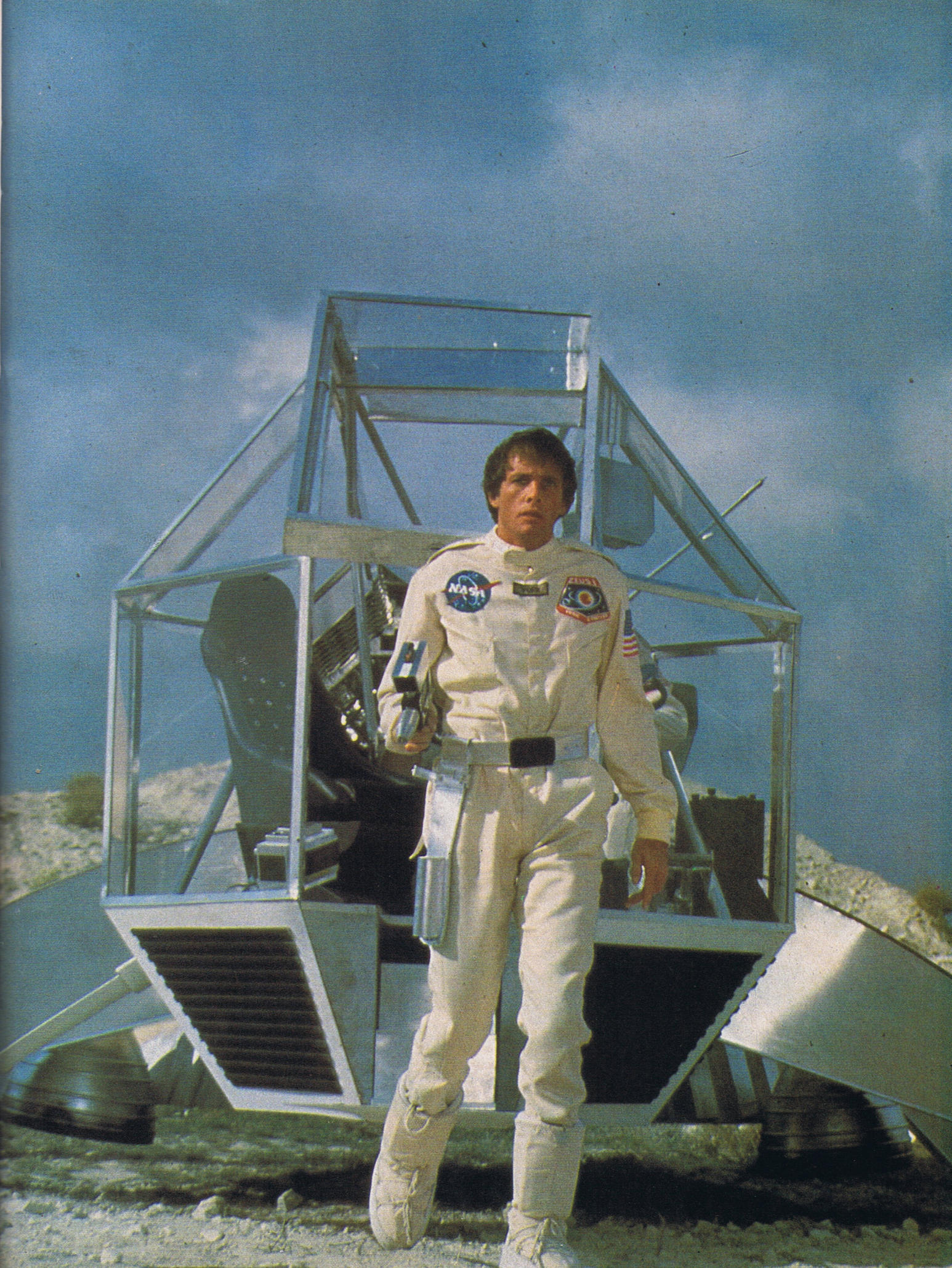
Associate producer Fries seems to sum up the feelings of the entire cast and crew when he enthuses, "*The Martian Chronicles* was a monumental undertaking. There's never really been anything like it offered on TV before. It's realistic fantasy. It was one of the most fantastic experiences of my life."

NEXT ISSUE: FUTURE LIFE goes behind-the-scenes for a look at the making of TV's *Martian Chronicles*. 



Above: One of the Earth crew's homes on Mars; a modular design constructed from abandoned rocketship parts. Right: The second expedition begins.

PHOTOS © 1979 NBC-TV





Sound Design

Starting off as a science fiction happening, futuristic rock is today very technological, very hypnotic and very repetitious... repetitious... rep



By JON PARELES

It's Monday morning, August 12, 2002. A work day. Even as you sleep off the weekend, you know that you'll be jolted out of bed much too soon by the radio-alarm you set last night. Precisely at 7:55 a.m., the radio activates itself. You wanted to wake up to the lilting strains of soft music... but what are all those crazy sounds coming out of that hi-fi speaker?

From a 1979 perspective, the sounds of tomorrow are anybody's—and everybody's—guess. There are probably as many speculations about tomorrow's music as there are musicians and listeners around to wonder. Some wonder about music's function: Will the future offer constant Muzak subtly altering people's moods? Or will there be specialized music designed for different locales—dance music for discos, driving music for car radios, digestive music for

futuristic eateries? Still others wonder about future music's content: What instruments will we be hearing? Will they be playing rock 'n' roll, jazz or something entirely new?

For a large segment of the contemporary music community, science fiction has provided a few clues and cues about things to come. Ever since Billy Lee Riley shook his hips to "Flying Saucers Rock & Roll" two decades ago, rockers have been writing songs with a science fiction basis. In the late '60s, the combined effects of psychedelia and the race for space gave science fiction rock a boost that hasn't subsided yet. The Jefferson Starship's *Blows Against The Empire* LP of 1970 is an album-length mini-opera about space colonization; jazzman Sun Ra has gone on record insisting that "Space Is The Place," and The Blue Oyster Cult have written songs around subjects like "Extra-Terrestrial Intelligence" and "Flaming Telepaths." Other contemporary space cadets include Journey,

Alan Parsons, Todd Rundgren's *Utopia*, Magma (who even invented an ET language for their long players), Ambrosia and even Steely Dan, who penned "Sign In, Stranger," a tale dealing with interplanetary crime.

Bands in England and Europe seem particularly drawn to science fiction imagery. Over ten years ago, the Rolling Stones sent audiences "2,000 Light Years From Home." Since that time, David Bowie has nurtured more than one Space Oddity and Peter Dinklage's Van der Graaf Generator has tackled such subjects as immortality and chemical mind control. Groups like Genesis and Be Bop Deluxe offer songs from a "what-if" standpoint: Anyone care for a Be-Bop catered "Honeymoon On Mars?" Or, who will soar with Genesis' "Watcher of the Skies?" SF author Michael Moorcock even got hooked on SF-rock, becoming so fascinated by an obscure band called Hawkwind that he based

Sound Ideas

a novel, *Time of the Hawklords*, on their history. They have since returned the favor by actually renaming themselves the Hawklords. They are still an obscure band.

Oddly enough, during a time when both music-making technology and listeners' ears have become exceedingly sophisticated, not many space-oriented musicians have bothered to enlarge their sonic vocabulary. It's a rare SF band that puts its music where its mouth is. Rockers who will spend hours trying to find a new rhyme for the word "galaxy" don't seem to be too concerned with creating innovative sounds. The same old rock 'n' roll guitar chords are good enough.

Meanwhile, a handful of bands, almost outlaw in nature, try to bridge the gap between thematic spaciness and outre sound.

One of the first rock bands to attempt to realize the sonic implications of their lyrics was Pink Floyd. Arising during the late 60s, they picked up quite a few sound ideas from the Beatles' groundbreaking studio masterpiece *Sgt. Pepper's Lonely Hearts Club Band*. The Beatles and producer George Martin concocted *Sgt. Pepper* out of every sound available to them, overdubbing them onto tape in combinations that could never be duplicated live. As a result, *Sgt. Pepper* demanded to be recognized as music *on tape*; music of an electronic age. Rock bands who had heretofore been content with freaking out on feedback began experimenting in the studios with various gadgets in an all-out attempt to catch up with the Beatles. But, while the Beatles had indeed created a sonic masterpiece, their work really amounted to electronic decorations. Brilliant, beautiful decorations hung on simple pop tunes. The stage was set for pop music to expand its boundaries.

Pink Floyd took studio music out on a radical tangent. From their earliest albums, Floyd was writing songs like "Astronomy Domine" and "Set the Controls for the Heart of the Sun." They were eager to sound as futuristic as possible. As they learned more about the possibilities of recorded sound, they began to let the recording process reshape their songs. They expanded their music around existing technology. By 1969, when they recorded *Umma Gnumma*, Floyd was producing sound sculptures. The result was strange, trance-inducing stuff—less the sound of music than the music of sound. As experimental classical composers had done a few decades earlier, Pink Floyd was taking

the tape medium on its own terms, accepting input from both man and machine. Around the same time, Jimi Hendrix was opening ears and minds everywhere by treating his electric guitar as an electronic instrument, wrenching out amazing sounds no one had ever heard before... or since.

Psychedelia faded. Most rock bands (including Pink Floyd) retrenched. Studio technology, for the most part, became, once again, a mere backdrop for pop. But there was a group of psychedelic diehards—listeners and musicians whose ears had been opened to the potentialities of pure sound. Coincidentally, compact audio synthesizers became available to the general public early in the 1970s. New music was thus handed its new tools.

The synthesizer itself wasn't a new instrument. Contemporary classical composers had been using bulky, studio-bound synthesizers in university electronic-music labs for years. They knew, as pop musicians were soon to learn, that the synthesizer is the perfect instrument for tape reproduction—because the synthesizer produces a purely electronic signal that can be fed directly onto tape. In a very basic way, it is perfect music for outer space because no air is needed to carry any acoustic vibrations.

Early synthesizer experimenters included Beaver and Krause, and Tonto's Expanding Headband, two musical units who expanded the state of the art but whose artistry never translated into sales. Robert Mason built his own synthesizer and, calling himself Star-drive, embarked on a solo career that was torn between musicianship and muzak and lasted but two long players. Walter Carlos gave synthesized sound a much needed shot in the arm with his spectacular *Switched On Bach* release, an album that brought synthesizers to the attention of both pop and

classically oriented listeners.

Classical composers had also discovered a simple device that would provide endless enjoyment for rock bands: the tape loop. Simply record something onto a strip of tape, splice the beginning to the end and you have a sound or riff that can repeat itself forever. With virtually any sound, the repetition becomes hypnotic... and with a synthetic sound no one is familiar with, the possibilities are mind-boggling. Back in the 1960s, composer Terry Riley concocted pieces called *Poppy Nogood and the Phantom Band* and *A Rainbow in Curved Air* from tape loops, mixing them in and out of earshot, piling them one atop another, adding and subtracting them from the mix.

Riley later applied similar ideas in *Church of Anthrax*, a collaboration with The Velvet Underground's founding member John Cale. It was clear that Riley was onto something. The tape repetition proved hypnotic and popular and his use of them linked his music, structurally, to the age-old styles from Bali, India, Africa and elsewhere; music that depended on droning harmonies and long stretches of repeated rhythms. The tape loop droning that Riley popularized is still echoed, somewhat unconsciously perhaps, in today's contemporary music. Everything from punk rock to disco emphasizes unchanging, hypnotic phrases. Chances are music will retain this effect for decades to come. (Recently, Columbia University's WKCR sponsored what they called "the first concert of the 1980s." A good portion of the program was devoted to hypnotic pieces, most implementing the synthesizer.)

Popular music has never before had an instrument as flexible as the synthesizer at its disposal. Theoretically, a synthesizer can produce any sound its user can conceive. It can make sounds with no specific pitch, sounds

Tomita's approach to synthesized sound encompasses both the futuristic and the classical.

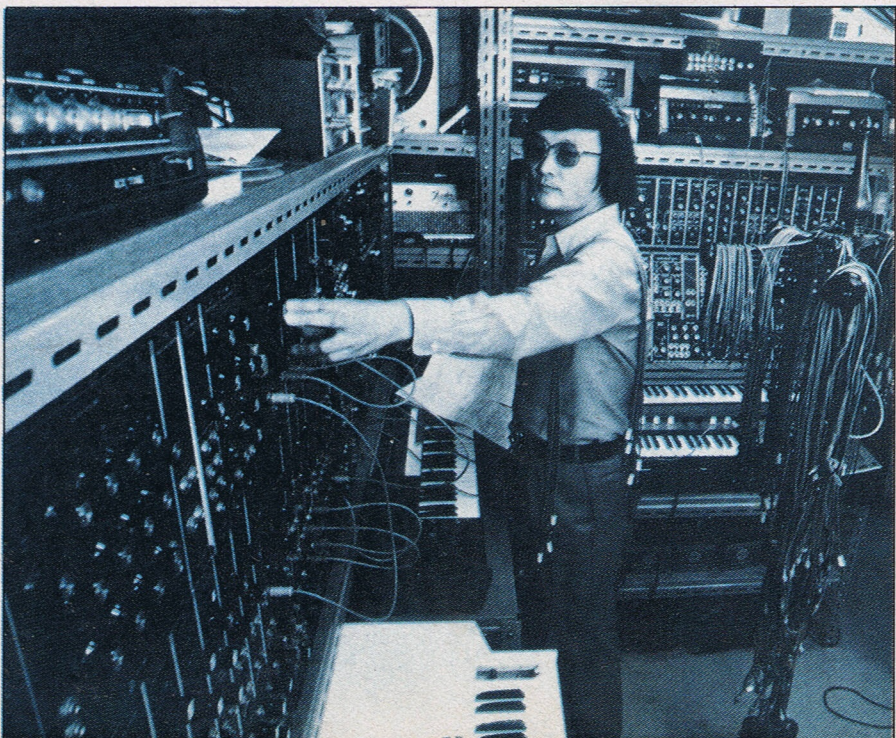
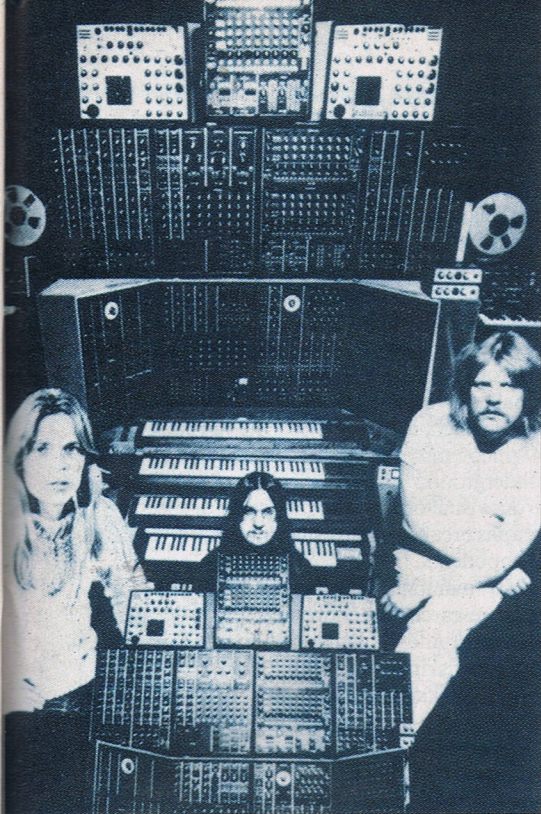


PHOTO: © RCA RECORDS



Tangerine Dream is one of the most popular synthesized rock bands in the U.S. today.

that change predictably or unpredictably, sounds in strict or random rhythms, sounds with unearthly timbre. Even as less adventurous musicians began using it to imitate existing instruments and provide sound effects, other, more experimental rockers began to explore the synthesizer in its own right.

Germany became one of the earliest centers for experimentation in rock. Two of the most popular German exponents, Kraftwerk and Tangerine Dream, define opposite ends

of the synthesizer spectrum. Kraftwerk (German for "power plant") has evolved a manifest for music of the future which states the belief that man will interact with machine in a new, creative synthesis. Kraftwerk is fascinated by mechanical things and their music is simplistic and almost robotically repetitious in nature.

Their first American hit, "Autobahn," captured the eerie pleasure of driving a fast, quiet car on an endless straightaway, accompanied only by the hum of engines and the whir of tires meeting concrete. Other Kraftwerk favorites include "Trans-Europe Express" and "Showroom Dummies." Their music is deliberately barren, sterile and metallic—the soundtrack for a future in which emotions have been sacrificed in favor of efficiency.

Tangerine Dream, on the other hand, is a band of idealists. Although they were formed in 1967 as a Godzilla-rock outfit, by '72 the band was a trio of melt-your-mind synthesizer players. Dream spins rich, liquid fantasies that slide smoothly from idea to idea and sound to sound, allowing the listener to drift into audio-fantasy worlds. Their synthesized soundscapes are lush and ever-changing; sometimes bustling with activity, sometimes somber and sustained.

In their book, anything is musical fodder. On their live albums, they carefully mix audience reactions into their compositions as a structural element. Much of Tangerine's music is improvised and their records cover a staggering range of moods; from ominous (on the Virgin LP *Stratosfear* and the MCA soundtrack for *Sorcerer*) to meditative (Virgin's *Rubycon*) to almost playful (Virgin's import *Force Majeure*). Lately, the band has added conventional elements like vocals and rock drumming, but they still

manage to retain the seductive flow of sound that has made them famous.

Past and present members of Tangerine Dream have also made fascinating inroads into future sound. Founder Edgar Froese concentrates on the subtle dynamics of continuous synthesized sound on his albums *Aqua* (Virgin), *Epsilon in Malaysian Pale* and *Ages* (Virgin imports). Klaus Schulze, who joined Tangerine Dream for a short time, is more interested in the sheer variety of sound textures. His double LP *X* (a Brain import) uses every type of musical sound from synthesizers to string orchestras. Michael Hoenig, another Tangerine alumnus, is more concerned with meditative stillness; the selections on his *Departure from the Northern Wasteland* on Warners sets up shifting sound patterns within a single key, operating like ripples in a pond.

Besides Tangerine Dream, a few other German bands deserve attention. Cluster is a synthesizer duo that specializes in gentle droning; their best known LP is *Cluster and Eno*, a Sky import collaboration between the duo and British avant-gardist Brian Eno. Popul Vuh began as an all-electronic group but their experiments have led them back to acoustic instruments and exotic traditional music, as their soundtrack for Werner Herzog's film *Heart of Glass* (Egg Records) demonstrates.

Berlin is still the center of electronic experimentation in Europe. David Bowie, Lou Reed and countless others have recorded in its futuristic recording studios. But it is by no means the only synthesizer stronghold on the Continent. In France, electronics whiz Tim Blake, formerly keyboard man for the group Gong, has inaugurated his own label, Egg, with very progressive aims. Blake himself is literally the loopiest musician on his roster.

(continued on page 66)

Electronic Music: A Reading Guide

Since electronic music is in a state of constant change, it is not surprising that few books currently in print contain up-to-date information. Walter Sear's *The New World of Electronic Music* (The Alfred Publishing Co., 1972) is an excellent technical introduction to the field. Simply and intelligently, it takes you from the basic science of sound up to the workings of a synthesizer. From there, you can go on to Allen Strange's *Electronic Music: Systems, Techniques and Controls* (W.C. Brown Co., 1972) and Hubert Howe's *Electronic Music Synthesis* (Norton, 1975).

For information on current work and new equipment in the field, the best place to go is your neighborhood newsstand. Unfortunately, most of the mainstream American music press fails miserably to cover the real vanguard in electronics. They are inevitably too late, tell you too little, and have no sympathy or understanding for the electronic

esthetic. Two exceptions are *Trouser Press* (147 West 42nd St., Room 801, New York, NY 10036), a rock magazine that frequently and enthusiastically covers musical electricians in progressive rock, and *Contemporary Keyboard* (Box 615, Saratoga, CA 95070), a magazine that focuses on keyboard instruments and their players, both traditional and electronic. Both of these publications are put out monthly, and should be available on most newsstands.

The British rock press pays much more attention to what progressives and synthesists are doing, both in the United Kingdom and Europe. If you are located in a major city, you should be able to find at least *Melody Maker*, though I prefer the less readily available *Sounds* and *New Musical Express* (all three are weekly newsprint tabloids). *Zig Zag* (10 Kennet St., Reading, Berkshire, UK), a British monthly of the fanzine type, also lends an ear to the Electronic New Wave, though most of their space is devoted to rockier material.

The best source for news of what's really going on, who's doing it and what they're using is a bi-monthly magazine called *Synapse*

(2829 Hyans St., Los Angeles, CA 90026; \$1.50 per copy plus 75¢ postage or six issues for \$8.00). The publication is geared to a specialized audience, so there are some articles that will be over the heads of the uninitiated, but for depth and breadth of coverage, *Synapse* is unquestionably the tops. It reviews records from around the world, interviews anyone who is important, reports on and discusses new technology in depth, and serves as the information locus for the world's synthesizer underground. Also commendable is its lack of discrimination against different musical styles—everyone from electronic punks to Stockhausen-inspired junior serialists are treated with equal respect. I recommend the publication highly to anyone with more than a casual interest in the field.

Finally, for technophiliacs, wiromaniacs and hardcore junkies, *Polyphony* magazine (quarterly; PO Box 20305, Oklahoma City, OK 73156; \$1 for a sample issue and \$4 for a one-year subscription) covers things from a more nuts-and-bolts angle. I've never seen it, but I understand it's quite good.

—Lou Stathis

MOVIE SOUNDTRACK RECORDS FROM STARLOG RECORDS

NEW! HERRMANN LIVES AGAIN

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BERNARD HERRMANN was one of the greatest composers ever to work in motion pictures. His scores to Hitchcock movies like "Psycho," "North By Northwest," "Vertigo," and "The Man Who Knew Too Much," were responsible for creating new heights of suspense, thrills, adventure, and terror. His music for "The Day the Earth Stood Still," "Seventh Voyage of Sinbad," "Mysterious Island," and "Journey to the Center of the Earth," helped make these films classics and endeared him forever to fantasy and science-fiction fans.

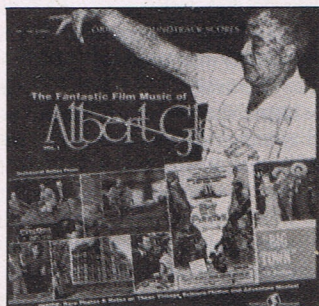
About a year before Herrmann's death, he composed and conducted a moody, mysterious score for "It's Alive," an SF-horror tale of a monster, mutant baby. The success of the film led to a sequel, and Herrmann's music was lovingly and respectfully reorchestrated and conducted by his dear friend Laurie Johnson. It's not party music; it's a score for those who want to dim the lights, get into a dark mood, and listen carefully to some wonderful musical chords and effects, including bizarre instruments such as twin synthesizers. The score to "It's Alive 2" (complete on this record) will recall the entire range of Bernard Herrmann's golden years in film music. *Can be played in STEREO or QUAD (SQMatrix)*

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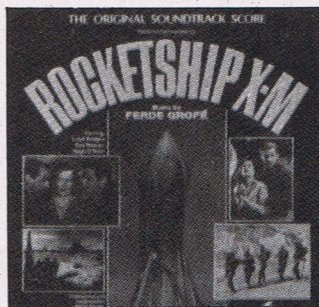
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Composer Ferde Grofe is best known for his "Grand Canyon Suite" and other classics. The theremin, a wailing electronic instrument used in Hitchcock's "Spellbound," is heard in the Mars sequences.

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Kitt Peak

(continued from page 18)

One of the most powerful research tools for solar studies today, this unusual telescope forms an image of the sun 34 inches in diameter, several times larger than any other instrument on Earth. The slanting shaft parallels the Earth's polar axis and allows an 80-inch mirror to track the sun with ease. The mirror beams the image of the sun to a smaller 60-inch mirror at the bottom of the shaft which, in turn, reflects the sun back to a 48-inch mirror, finally bouncing to an underground observing room where, aside from visual observation, an array of spectrographs break the light down into its individual components.

To maintain constant temperature for solar research, the entire structure is encased in copper and coolants are pumped through the outer skin.

Kitt Peak maintains an "open door" policy which permits qualified institutions to establish their own facilities on the mountain. A similar policy applies to astronomer-use of the telescopes, the only criteria being the research proposed. Of importance to many FUTURE LIFE readers is that several colleges and universities have instituted undergraduate and graduate programs in astronomy that are entirely off-campus involving up to a full term of coursework on Kitt Peak. Dartmouth College is one of these, while the University of Michigan conducts an intensive one-month course in observational astronomy for seniors and first-year graduate students.

Kitt Peak is also open to the public daily from 10 a.m. to 4 p.m. with guided tours on weekends and holidays. The Observatory boasts picnic grounds (with some fantastic scenic views all the way into Mexico) and a small museum, along with the inevitable museum gift shop.

Astronomy, mankind's oldest science, is constantly making refreshing and exciting inroads into our understanding of the universe. Facilities like Kitt Peak are gathering the data today that will someday enable our starships to traverse the vast distances to places "where no man has gone before."

FUTURE LIFE readers who hope to be involved in astronomical research, either on or off Earth, would do well to look into the programs being offered at Kitt Peak by the following universities:

University of Arizona
California Institute of Technology
University of California
University of Chicago
University of Colorado (at Boulder)
Dartmouth College
Harvard University
University of Wisconsin
University of Michigan
Yale University
Indiana University
Ohio State University
University of Texas (at Austin)
Princeton University
University of Hawaii

How to Be a Successful Inventor

Many frustrated inventors write to me because I'm president of the L-5 Society. And they're right, I do know how to help lone inventors. My husband is a full time inventor; his devices labor away in candy factories and tractor plants, monitor giant mine trucks and protect water pumps. His research shows up in the major space manufacturing technical works.

I've had the pleasure of helping turn his schematics into hardware. How? All it takes is skill, hard work, good advice, and money.

Let's work on skill first. Have you studied college level physics? I don't mean the creampuff courses they offer pre-med students; you have to take the stuff that requires calculus. Mechanics, electromagnetism, thermodynamics, optics and acoustics are essential. Beat it into your head until you can look at a scheme and immediately determine whether angular momentum is conserved or whether it obeys the second law of thermodynamics. Nine out of ten of the schemes people show me violate the laws of physics. They'll never fly.

Some kooks think the laws of physics are a conspiracy by evil scientists to keep reactionless drives and faster-than-light starships off the market. These people remind me of the Tucson gangster who bribed a building inspector to approve his bowling alley design. However, the law of gravity wasn't circumvented as easily as the laws of Tucson. The bowling alley collapsed. Then there was the Arizona legislator who proposed the repeal of Carnot's law in order to save fuel.

Sharpen your skills with plenty of math. Learn how to use Fourier and Laplace transforms, Bessel functions, Lagrangian interpolation and more. Study numerical analysis and how to get your computer to do the calculating for you. If you don't have something fancy on hand, at least get a calculator with trig functions and a decent memory.

I remember when I independently thought up the idea of the tethered geosynchronous satellite—the "skyhook" concept. That is, I got an intuitive grasp of the idea. But I couldn't determine whether we had any materials strong enough to build the skyhook because the solution to the problem involves integrating over a diminishing gravity field, and I couldn't integrate. My husband found an article in *Science* for me where the math had been worked out. It was Greek to me. But I got the



message: I spent the next four years buried in math books.

Yes, there are math kooks, too. I had to throw an old man out of my office because I tired of his demands that I join his crusade to declare pi equal to exactly 3.14. "There are no irrational numbers in nature," he declared.

You absolutely must have good advice. Many inventors go wrong because of obvious flaws in their concepts that a skilled friend could probably spot. One of the major reasons to attend technical conferences is that they are the perfect place to make friends who can help you turn that rough idea into real hardware someday.

Don't let pride trip you up. No matter how brilliant a researcher may be, he or she always looks to friends for advice.

Next comes the hard work. Could you do without your yearly vacation in the Bahamas? Do you mind working Saturdays? Can you survive on only six or seven hours of sleep a night? Do you mind scarfing down a cold taco and a warm soda pop with your left hand while you type data into the DEC-10 with your

right? Could you sign checks and write contracts while nine-and-a-half months pregnant—with contractions five minutes apart? If the answer to all these is yes, you're probably not *too* lazy.

Finally we tackle the money problem. People with sound, ingenious inventions write and call me with the same old sob story. "NASA won't give me a cent." "My wife left me because I spent our life savings on my invention." "The aerospace companies don't even answer my letters." So what else is new?

Peter Glaser, inventor of the solar power satellite, promoted it for four years before getting a cent of NASA money. Gerard K. O'Neill, world famous space colony researcher, traveled around the country pushing his ideas for six years before getting his first grant.

How about Peter Vajk, the space industrialization pioneer? He lost his job at Lawrence Livermore because he spent too much time working on space colonies. T.A. Heppenheimer was fired by Rockwell for the same reason. But they didn't waste time feeling sorry for themselves. Heppenheimer is now working full time on space colonies as an independent consultant, has written a lucrative book, *Colonies in Space*, and has another, *The Colonists*, about to hit the bookstands. Vajk was snapped up by Science Applications, Inc., which needed a space industries expert, and he wrote *Doomsday Has Been Cancelled* in his spare time.

I enjoy asking the authors of space industrialization research papers who funded their work. Often they reply "Oh, I did this research in my spare time. Hope the boss doesn't find out that I swiped some computer time."

When my husband started his electronics company, Analog Precision, we had no money. But we needed a building and tens of thousands of dollars worth of test gear, circuit board facilities, machine tools... what a list of things! So we cut our living expenses way down—below the poverty line—remortgaged the house, borrowed up to our ears from the bank and all our friends, borrowed the equipment we couldn't buy, and hustled like crazy.

It worked!

It can work for you, too. Reach for the stars!

In the early 1930s, when the Depression was at its worst, people looked to the future to provide them with a better and more comfortable world. Magazines of that period such as *Modern Mechanix* concerned themselves with the technical marvels which they felt would come about through the almost magical workings of science. The following three modes of transportation were considered distinct possibilities at the time these articles were written. They may seem quite absurd today, from a distance of 40 years. But while we smile at the lack of skill and knowledge with which they were made, perhaps we should also applaud the active imaginations that made them.

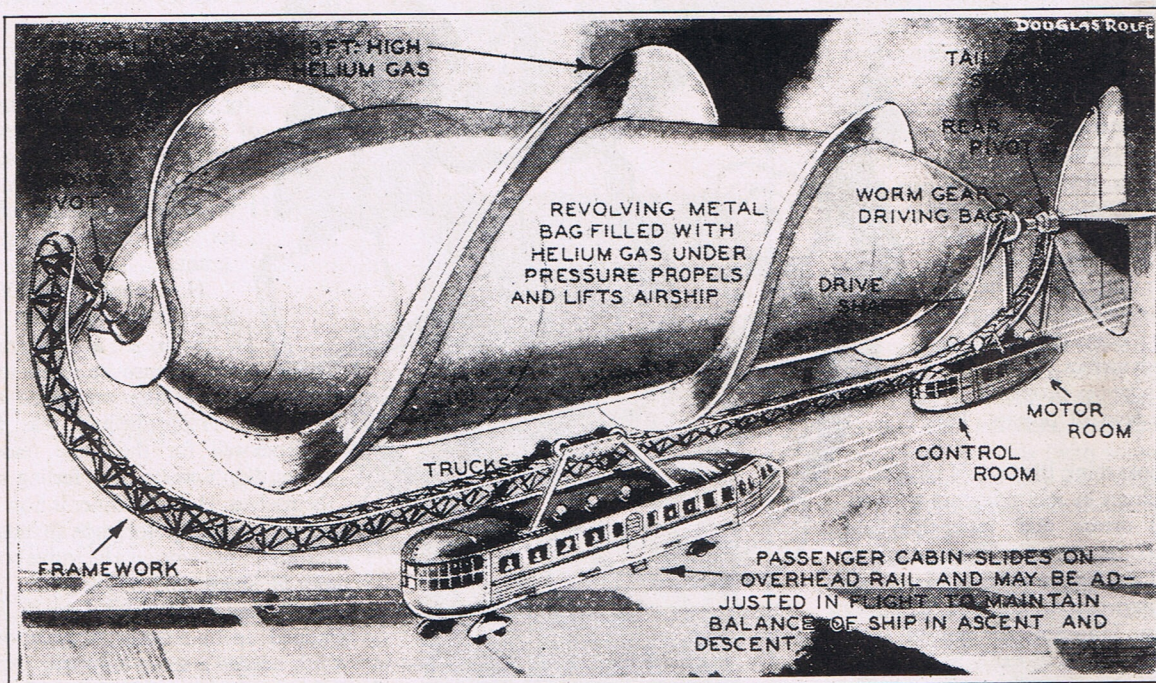
TURBO WHEEL LINERS To Speed Across Seas

Aviation's rapid strides are revolutionizing all other modes of transportation. Railroads are meeting the demand for greater speed with streamlined trains. Automobiles are following the most modern trends in streamlining.

On the seas, however, even a streamlined ship will not be able to meet the competition

of regular airplane schedules touching airports anchored in the ocean. Resistance from wind is great, but the sea itself slows down an ocean liner much more.

To overcome this an inventor has conceived the Turbo Wheel liner, which is expected to reach a speed of 100 miles an hour. At this speed, the rapidly revolving wheels of



Proposed Rotary "Aero-Zep" Uses Screw Vanes

Almost unusual type of dirigible involving wide departures from established principles has recently been patented by two South Dakota inventors. They call it the "Rotary Aero-Zep," and aside from the fact that the entire craft is designed to be constructed of aluminum, the most novel feature of the invention is the metal gas bag which is designed to revolve around the frame, trackway carrying the passenger car, screwing the airship forward in the air through the action of spiral vanes on the side of the bag.

These vanes, three feet in height, are V-shaped and hollow, and are themselves filled with helium separately from the gas bag. The passenger cabin is suspended from a track

running beneath the ship, being mounted on trucks which are free to move along the track to keep the weight of the ship balanced as the angle of ascent or descent varies. The track framework, curving upward at either end, supports pivots on which the bag turns freely. To call the gas container a bag is a misnomer, since it is to be of corrugated aluminum.

A motor cabin, mounted permanently at the rear of the trackway, contains engines which will drive the revolving bag. Tail control surfaces are of conventional design, except that each of the four sections is separately controllable—that is, the right half of the elevators can be controlled independently of the left, the top section of the rudder in-

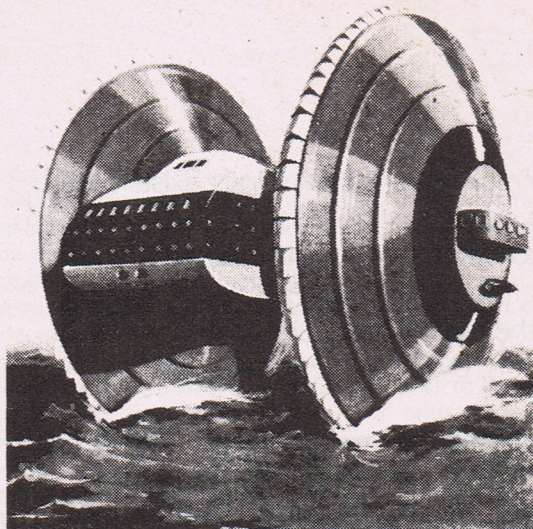
dependently of the bottom, in contrast with usual practice in which both sections of rudder or elevator are operated together.

Seven hundred miles an hour is the rather incredible speed anticipated from the craft by its inventors, Rev. Carl H. Loock and Lorrin L. Hansen of Rapid City, South Dakota. The bag itself, through its novel drive, will revolve comparatively slowly even when the ship is traveling at top speed, the inventors believe. A safety valve at the end of the body is provided in case gas pressures are built up to a dangerous degree. As yet this amazing new idea in aeronautics has not progressed beyond the model stage, and it is not at present known when a full size ship will be built.

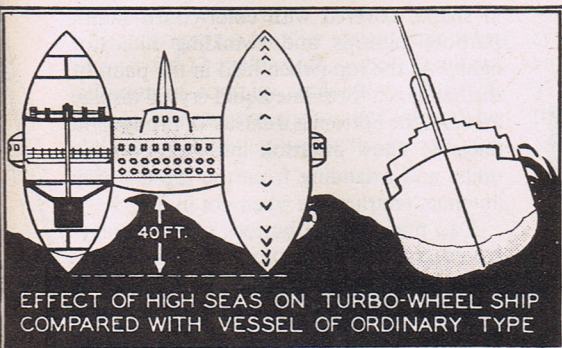
the liner will lift the hull out of the water. The ship will ride on the outer rim of the wheels only.

A lifting tail of airplane type holds the hull parallel to the line of travel. Normal airplane rudder and tail flaps control steering at high speeds.

At low speeds a revolving rail float is lowered to support the rear end of the hull and provide steering. Powerful Diesel type engines slung low within the rotor wheels drive each wheel independently through gearing. The Turbo Liners are expected to be capable of a speed of 100 miles an hour.



This radical design for an ocean liner would revolutionize sea travel. This ship could travel 100 miles an hour.



RADIO TUBE TRAIN GETS POWER FROM AIR

Transmission of power by radio will result in some radical changes in the industry, especially in the field of transportation.

Recent experiments with railroad handcars run by radio suggested the design for a radio tube locomotive shown here. The electrical engineer who conceived the unusual power plant claims that such a locomotive could be controlled without a pilot.

The body of the locomotive would be surmounted by a series of huge radio rectifier and receiving tubes. The gigantic tubes could be built of unbreakable glass. Vanes running the full length of the car above and below the tubes will radiate excess heat and prevent the red hot electrodes from melting.

Electrical power impulses from a hydro-electric generating plant would be picked up by the antenna, rectified, and transmitted to the motors. Radio impulses could also control the train.



The computer and communications technology exists today. To make this massive interface system possible, it only remains for private businesses to begin refining the actual hardware and marketing the system on a very wide scale. This article dramatizes the idea. If there are visionary entrepreneurs reading this, by 1995 they could put...

THE WHOLE WORLD IN YOUR HANDS!

The Personal Computer Connection—Tomorrow and Beyond

By KERRY O'QUINN

In last issue's Output column I described the ways in which computers have evolved during the past 25 years. I wrote that IBM has brought the cost for a million bytes of storage down from \$221,867 to \$430. They have increased processing speed from 2,193 multiplications per second to 239,120, and most important for the man on the street, IBM has reduced the physical size of hardware: In 1953 IBM required 400 cubic feet for hardware to store one million characters, but today that same capacity fits into .03 cubic feet—about the size of a baseball. There is no indication that this efficiency/size/cost trend has reached a climax or is even slowing down. What kind of evolution will the next 15 years hold in computer technologies? That is where this article begins.

"I am absolutely certain that if society continues to survive, that technology will continue to advance and that computers will become far more elaborate and far more convenient than they are now."

—Isaac Asimov

U p'til now, computers have been one step removed from our everyday lives. They have been adding to the efficiency of large private companies, utilities and government. We've felt the effects, for better or worse, but lightning data processing has not struck the home—on a personal level.

The accelerated advances that have taken place in the computer field have now reached a stage of development in which they are beginning to filter into consumer hands. Already there are inexpensive home computer units and games, but these are merely primitive first-stage units compared to the role home computers will play in our lives in the near future.

Imagine 16 years from today—New York City in 1995—and let's look at a possible picture of the lifestyle changes created by computer personalization.

Our imaginary family—let's call them the Vernes—are middle-income people. Both parents work, and they have three youngsters in school: Jim, 20, in college, studying business and technology; Judy, 17, in high school, mainly interested in boys at the moment; and little Joe, 11, an avid science fiction fan who enjoys old-time classics like *Star Wars* as well as Gerry Anderson's current TV series.

On this lovely spring morning Dad is busy painting away in his art studio. With bold strokes of white he is inserting his famous glints of sunlight at strategic points along the glass and metal spires of his latest skyline

landscape. His personal pocket-size computer terminal unit is propped up against a stack of white boxes, sometimes used as a model's stand.

The unit breaks into a pure-tone version of the famous melody from Rachmaninoff's "Rhapsody on a Theme by Paganinni," programmed as his alarm tune because it is one of Dad's favorite classics. He had completely lost track of time, as he usually does when absorbed in his work. He finishes a dazzling reflection of light, wipes his brush clean, humming along as the melodic phrase is completed, and picks up the terminal unit.

It is less than a half-inch thick, rectangular in shape, covered with color-coded multipurpose buttons and twinkling indicator lights. At the top (when held in the palm of the hand) is a three-line liquid crystal display area. At the bottom is a cluster of prongs and tangs to allow insertion into non-portable units, and extending from the top is a tiny antenna—retractable when not in use.

Dad punches one button, which displays the exact time—12:03 p.m.—then he pushes a few more buttons. The display tells him he has had two phone calls during the morning by showing him the calling numbers. Dad immediately recognizes one as being his good friend Ron, but the other number is not familiar. He can return the calls, or if he wants to hear the recorded message...

He punches another button and enters the mysterious phone number. The amazingly powerful little speaker in his hand unit plays back the recorded message, and Dad discovers the caller is a magazine editor who saw one of his paintings at a gallery and wants him to do an illustration for an upcoming article.

Dad decides this is a good time to break for lunch. He'll look over his calendar of commitments for the next couple of months—stored in the computer—and see if he can squeeze in this exciting new assignment. Before he retracts the antenna, he punches a few buttons for the home "bulletin board"—to see if he has any messages from other family members.

Meanwhile, at her office, Mom is trying to find a stopping point so she can run out for lunch. She is associate publisher of a popular futurist magazine, and stopping points are rare in publishing. A few minutes earlier she heard her personal computer terminal beep the hour automatically while she was in the midst of an editorial meeting. Usually she doesn't go out to lunch, but there was *something* she needed to take care of today. She can't recall what.

Her terminal unit is propped up on the desk, antenna out, cradled in a streamlined lucite block, cut and polished by her son Jim so that it catches the overhead room light and turns it into a kaleidoscopic explosion of colors. She picks up the unit, flips open the cover

and punches up her personal reminder notes. Ah, yes... she needs to shop for Judy's birthday present.

While looking at her FutureCharge account last night, she noticed that if the automatic first-of-month deduction were made from her account by the FutureCharge computer it would put her bank account in the red. Before she goes shopping she must decide whether she wants to break up the payment into monthly installments (again, deducted automatically) and pay interest for prolonged credit, or whether she wants to punch in instructions to make her savings account available for a FutureCharge deduction.

It's certainly a handier system than when she carried 12 credit cards, a check book and all sorts of courtesy cards. Now all her financial transactions are handled through her individual computer unit with the base storage at home.

As she heads for the elevator, her terminal unit tucked neatly into her purse, she thinks of how amazing this family computer system is. How did they ever live without it?

Sitting at home, on a shelf of a closet, is a box about the size of a large suitcase—their home computer unit. Actually, the crucial workings are much smaller than the outside case would indicate, but theft would be too easy if the unit were only shoe-box size—hence, the extra bulk. This base unit is attached via cable to (a) their bank, (b) the FutureCharge headquarters, (c) Manhattan Retail, a company that provides clearing house services for member stores all over town, (d) National Interchange, a similar system for airlines, hotels, and other nationwide out-of-city business activities, (e) Global Trade, with world-wide satellite linkage, (f) their telephone system—and various other services.

Each member of the family has a portable unit, with an individual sub-code that identifies it as part of this particular home base unit. Although each palm-sized terminal has all the usual functions of calculator, watch, stop-watch, calendar, alarm, etc., it is mainly a "transceiver," providing each person with access to the home unit data, and through that to stores, banks, schools and to each other.

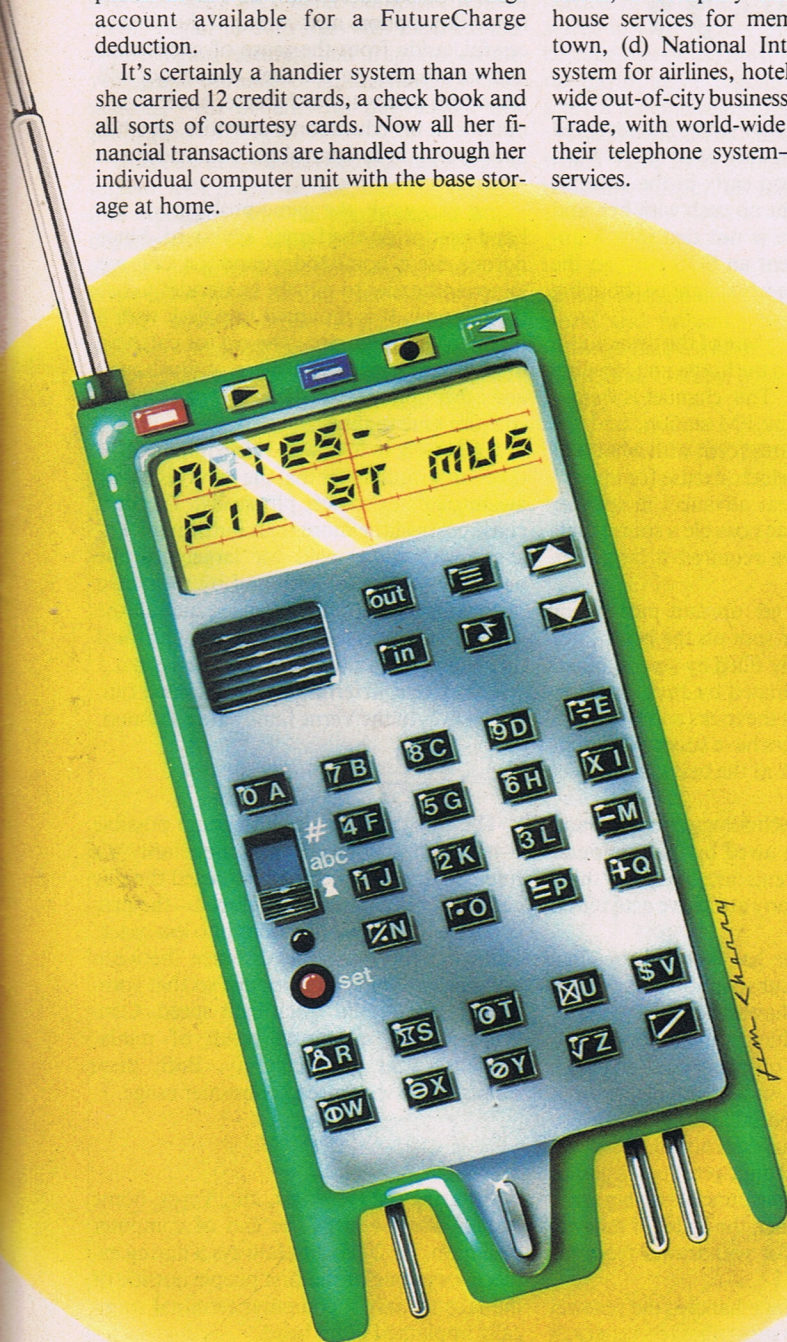
Even amid the tall buildings of Manhattan the battery-powered transceiver achieves incredibly good contact, and in cities like Canton, Ohio, the range easily reaches to Akron. When a member of the family travels out of town the portable unit plugs into restaurant and store registers for retail purchases and payments, but for family communications it is necessary to establish a *local* transceiver link. Most hotels can provide their guests with room base units that connect (via satellite or phone line) to their home base unit.

As Mom steps out onto the sidewalk she notices a street musician with an elaborate portable scaffolding of hanging glass pieces. The fellow has a solar generator hooked up to a tiny amplifier and six clustered speakers. In each hand he holds a mirrored paddle, and as he moves his arms, catching rays of sunlight and directing them into the glass fragments, light is reflected into a row of power cells and turned into musical sounds.

The young man is dressed in colorful pieces of gossamer material that wave and flutter as he quickly moves his arms into the semaphore-like positions that skillfully create a delightful, happy tune of surprising harmonic richness. Along with other pedestrians, Mom stops and enjoys. She reaches into her purse to toss a few coins (one of the few remaining uses of physical money) but also to withdraw her terminal unit and punch in a reminder note to send a photographer down here. This Rube Goldberg "orchestra" will make a good little news item for the Databank section.

Jim has no classes that afternoon, so he has run by the Shopplex to buy some buffing pads for his lucite sculpting. Sure, the chemical and sonic polishers are okay, but Jim likes the craftsmanship he can put into a job by hand. It's a needed contrast to the abstract mental work he does most of the time. Relaxation.

While he's at the stores, he drops by the Foodomatic. He's responsible for shopping this week, and although he *could* order essentials from home through the computer tie-in, he enjoys walking through the display section and seeing the product choices in person. He punches up the grocery list on his unit and sees the items family members have entered during the past few days.





“The accelerated advances that have taken place in the computer field have now reached a state of development in which they are beginning to filter into consumer hands.”

The packaged-foods section displays one of each item, with complete nutritional and pricing information. Jim punches buttons mounted on each display to tell the auto stock selector how many of each item—inserts the plug-in end of his terminal in the slot below each item, with a quick instruction to execute the order. By the time he reaches the check-out counter his foods will be there waiting, along with his bill.

He leaves the packaged-foods section and passes through the produce area. This is where the real old-fashioned fruit-squeezing still goes on. He selects a good head of lettuce, some tomatoes, fresh kiwis and boysenberries, and carries them to the exit lane.

At the counter, produce items are added to his packaged order. As usual, this in-person visit has tempted him to buy more items than were on the list, but as he scans the list to be sure he hasn't forgotten anything, he notices a new entry, just received—suntan oil. He chuckles, deducing where his sister is spending the day, and decides he'll pick that item up at the ChemMatic on his way to the car.

The pretty clerk tells Jim his total—he inserts his unit into the customer slot—in a flash the total is deducted from the family bank account and paid to the Foodomatic account. No shopping list—no money—no checks—no paper.

During that brief check-out insertion, the store also feeds the itemized transaction into the Verne home unit so when Jim unpacks in the kitchen he can check the accuracy of the prices and items. He will then erase the list, but the home unit will retain and categorize the transaction total. Next year, when tax time rolls around, all financial records are ready for computation. Dad has Stan, their accountant, work up the forms, and Dad simply feeds all his private financial data into Stan's office unit. The Vernes resent forced taxation, and the more out-of-sight and automatic the whole process—the less painful.

Lying on the beach, beginning to feel the

pain, Judy realized that when she returned home she would probably be as red as Mars (too little caution, too early in the season), and since she brought no cash with her, and the little beach store is not tied into Manhattan Retail, she sent an SOS back to the home unit for anyone who might be shopping today.

Now she switches to one of the three audio channels patched into the home unit, feeding all family terminals. This channel is *hers*—pre-set to her favorite FM station, and the tiny terminal unit blares forth with what is to Dad “the most unmelodic excuse for music” he's ever heard. Great advances in speaker technology have made possible a sound that, in 1979, would have required a large box speaker.

An older couple get up and move their blankets to a quieter spot on the beach, but the position is quickly filled by several blond beach boys, all fascinated by Judy's device. She is well aware that the tricks and gimmicks of personal computers have superseded dog-walking in New York as the best way to meet people.

Judy accepts the technology as natural and common. She is not awed by this computer system like her parents are, but she thoroughly enjoys the many attractive activities it adds to her life.

At home little Joe has received the final copy in his current subscription to STARLOG magazine. He could have subscribed to the video-feed version, which is much less expensive than the printed-on-paper edition, but he is a collector, and he works three days a week to earn money for special luxuries he enjoys. His computer terminal does not allow him access to the family account yet, but without a moment's hesitation he punches up his STARLOG subscriber number, the code for renewal and the command for withdrawal from his personal account.

National Interchange handles the renewal transaction. Joe also subscribes to STARLOG's weekly video news service, which feeds into

the home unit up-to-the-minute pictures and commentary on science fiction events. Joe can withdraw this news program from storage at any hour and have it projected on the home screen; he can divert it into his little bedside tube TV or he can have it printed with the hardcopy unit stored in the closet. He has to get Dad's permission for hardcopy, since it uses paper and is therefore expensive.

Today, Joe is exercising the option permitted by his private school to stay home and complete the game-problem for that week, fed into home units of all students. The game-problem is much more difficult than the work he would be doing in school, but this way Joe can do other things during the day and take a break when he feels like it.

Many private schools use similar systems of giving the students learning choices and rewarding those who successfully accept the responsibility. If Joe does *not* complete the game-problem successfully he will forfeit his home-day option next week; if he *is* successful, aside from the sense of confidence and satisfaction he will feel, the school will allow him points toward greater choices and options in his educational activities. Joe has already begun to control his own education—his own life.

Joe can work the game-problem via his hand unit or on the family keyboard. Since no one else is home today, and the keys are larger and easier to punch, he decides to use the big unit. It is mounted in a desk with a monitor above the circuit board for patching in telephone service, recorders, audio inputs, and other optional functions that can be added from time to time.

Joe is truly in love with this equipment. It takes up so little space that the family is barely aware of its existence, physically. The purchase cost is little more than outfitting a kitchen, with *usage* paid for largely by the businesses they deal with and by their own savings in transportation, paper, and all the alternative wastes they would be paying for if they didn't have a family computer system.

The effects, in terms of efficiency and fun, on the lives of the Verne family are profound.

* * *

The thing that made this system possible—technically, physically and monetarily—is *miniaturization*. The process started the day computers began to be developed—the process of getting more functions into less space, reducing the physical distance between millions and millions of points so that computing speed could reach light speed. Convenience was a natural result of miniaturization. So was economy. Both these results led to widespread consumer usage.

* * *

Amazing as 1995 was, the Verne home system did not mark the end of computer evolution. By 2005, Jim (always a daring explorer) was one of the first people outside of the labs to have a computer terminal surgically implanted in his head.

No longer did he have to carry that clumsy

hard unit everywhere—his unit was *part of him*. No longer did he have to plug it into customer slots—his *fingertips* provided instant identification and transmission. No longer did he have to worry about a tiny breakable antenna (his whole body served most efficiently), dead batteries (the unit functioned off his body's electro-chemical properties), or a misplaced unit, accidentally left in another coat pocket.

Jim's mom and dad had reservations about the implant at first, and Judy thought the whole idea was *unnatural*—"it's like artificial insemination!"—but Joe loved the idea. So did the lady Jim was living with.

The implant gave Jim instant access to volumes of data, allowing for the handiest computation and communications functions ever known to human beings.

Of course, there were a few problems, some kinks that had to be worked out, and over the years they were. Computer refinements began to converge with medical and psychological research, and in spite of all the yelling and warnings of anti-technology "humanists," the benefits far outweighed the problems.

In 2030 a unit was devised that made Jim's implant look *primitive*. Joe, then 46 years old (life expectancy was 125 years), leaped at the opportunity. He was, by that time, rich enough to afford the new implant and he knew it was what he had been working for.

The sensitive brain implant unit was delicately interconnected to monitor most of the body's biological functions and could supply instant health data to Joe or to an at-

tending physician. It was also capable of taking some corrective biological actions, but—most important—it gave Joe access, at will, to much of his subconscious.

Joe began to understand himself, his organism, from the inside out. He became intimate with his own body, examined and explored his emotions, his deepest values. There was less mystery—less feeling of being out of control, out of touch with things inside.

The informational advantages alone were incredible: it was like having a library in his head—everything he ever learned, readily available. But the emotional and motivational advantages were probably most important to Joe. His knowledge and comprehension improved—his confidence improved—and as a result, his happiness increased to an almost perpetual state of euphoria.

Joe enjoyed the pleasures of life with greedy relish, and his enthusiasm for work carried him forward with research that resulted in even greater life prolongation. He became one of the most important people of the Earth, and everyone benefitted from his zeal for the challenges and risks of being alive.

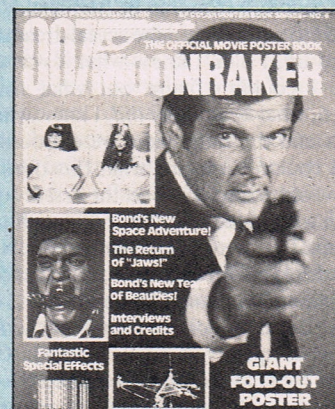
His mom and dad, had they still been alive, would have been proud beyond words of their little Joe, on his 100th birthday.

* * *

The human mind reached out into the world and fashioned things of that world—things that could be brought back into its midst and thereby enlarge its conquest of reality.



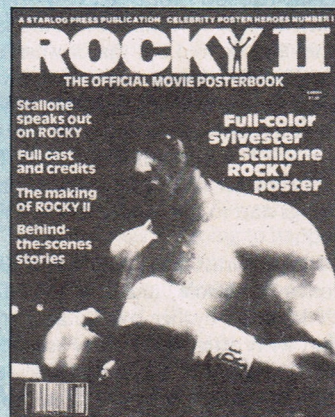
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Vonda McIntyre

(continued from page 24)

healer in a post-holocaust world. But, since I wasn't a big 'cow' fan, I decided to use that word as a verb. Cow: to be frightened. I just started to write. When the actual dreamsnake turned up, I didn't know what it was at the time. I couldn't figure out what role he played, what he actually *did*. I knew what the cobra and the rattlesnake were around for, but I couldn't imagine what this third little guy would do. So, I just set the first few pages of the story aside and didn't do anything for the next four weeks of the workshop. Now, I have this low tolerance to recreational drugs. One glass of wine and it's bye-bye. So, I don't smoke dope. It took me four weeks to figure out what quality a snake named 'Grass' should have. When I finally figured out what the dreamsnake was, I just stayed up one night and wrote the whole story. I managed to keep my eyes open during class, hand it in and then drift back into my room and crash.

"I fell sound asleep. One of my friends in the workshop burst into my room in the middle of my snooze. She woke me up and threw my manuscript on the floor. I was still half asleep. 'What's the matter? Is something wrong at the workshop?' She glared at me and said 'How dare you write a story that makes me feel sorry for snakes?' I promptly fell back asleep. A couple of hours later I woke up and figured out that it wasn't all a dream. The story was pretty well received.

"That's often how stories come together. You have a couple of elements that you think could make a good basis for a story. But it isn't until you get a third and a fourth element that things start to come together like a jigsaw puzzle."

"Of Mist, Grass and Sand" garnered the newcomer a Nebula, and McIntyre found herself haunted by her own characters. "I couldn't write after the Nebula," she recalls. "I kept thinking of the possibilities to be found in the Snake character. Yet, I wasn't sure that I should go back and tamper with the original short story. What finally brought me back were the characters themselves. They really did. It sounds quasi-mystical to say that these characters, nurtured in my head, actually said that 'you will do this' or 'you will do that,' but I just couldn't write anything without seeing them there.

"Yet, I fought the urge to expand the short story. Basically, I don't really approve of doing sequels to things that people have already enjoyed a lot. Far too often, you drain the effect of the original in the next version or the version after that. You get more and more diluted as you progress.

"Of Mist, Grass and Sand" was published in 1973. I didn't start working on *Dreamsnake* until 1975. I beat it off with a stick for two years but, again, I wasn't getting anything else done. Everytime I'd sit down to write, Snake would sort of come along and say things like 'You've left me hanging by my thumbs and I don't like it too much.' Finally, I sat down and worked up the novel."

With the publication of *Dreamsnake*,

McIntyre found herself singled out for her humanistic approach to science fiction. Many critics felt that she was an emotional exception to the dispassionate rule of science fiction. McIntyre disagrees with this somewhat sterile interpretation of the SF genre.

"It's true that science fiction doesn't always offer the most in-depth characters in literature," she says, "but that fault can be found in every other form of fiction as well. It's easier to point to science fiction and say, 'Aha, *that's* SF, no human emotion,' because of the plot elements involved, the otherworldliness. But if you look at mainstream literature, you'll find that there is a lot of superficial mainstream literature that's not very high on characterization. It's high on action and sex, or action and violence. But no one will point to a junky mainstream novel and say 'This is mainstream. This is junky. Therefore, Dostoyevsky is junky.' Whereas people can feel perfectly justified in pointing to Perry Rhodan and saying 'This is a junky SF novel, therefore Ursula LeGuin is junky and I won't read her.'

"It just isn't fair to the genre. Think of it. Before the 1920s, it wasn't a genre at all. Science fiction was considered part of literature in general. It's still not considered a genre in England. Here in America, we're finally sort of getting out of the genre mentality, which is nice. Perhaps, someday, people won't lump everything together and say that it's all the same."

McIntyre regrets the tendency shown by critics to overlook genre books except for the few science fiction works to achieve mainstream popularity. "There is a lot of fine writing going on today in science fiction. Important writing. Heartfelt writing. Yet some people refuse to acknowledge its existence. I constantly get letters from people who really want to write science fiction but don't know how to go about it *legally*. I got a letter from one English student who really wanted to learn how to write. Her professor would just sort of spit at her science fiction stories and say 'This is junk. Why are you wasting your time on this?'

"A lot of the academic world is still suspicious of science fiction because of its popularity. They are also suspicious of it because, traditionally, you were supposed to be suspicious of it. There is a lot of garbage out there, though, that's never attacked at all. You can go to the newsstand and find 240 western novels that are practically the same TV script. The bad guy wears black and challenges the good guy in white to a showdown. The good guy wins and marries the schoolmarm. Now, that's hack stuff. But that's also the plot of the novel *The Virginian*. It's a fine book. No one looks at this book and says that, since there are a lot of junky western books, *The Virginian* must also be junk. But, again, people always do it with science fiction."

Despite the widespread literary dismissal of the genre, McIntyre is proud to be labeled as a science fiction author. "I don't feel hemmed in by that label. I sometimes get upset, though, in that I know there are people who won't read my work because it's called science fiction. But it's called that because it is

that. I can't write anything but science fiction. I tried once and it was a disaster."

Although mindful of the inconsistent critical rewards of science fiction literature, McIntyre is quite content with her lifestyle thus far. *Dreamsnake's* author, who once relied on the pros of the genre for help and guidance in shaping her own career, now feels it only natural to offer encouragement to the newest breed. "Talking to young writers about their work isn't one of the drawbacks of being a success," she insists, "It's one of the things I enjoy most.

"I can't take manuscripts home and read them, of course, but I'll discuss things with writers. Many people ask me how to write. Now, there's no way you can teach someone to be talented, but you can tell people some of the tricks of the trade. The things that, if you do them wrong, you're immediately branded a novice. You know, like learning the proper way to write a cover letter. You don't write cover letters that say 'If you don't buy this story, my baby will starve to death.' That's not too hot a way to approach an editor.

"I also tell people to avoid purple prose and 'said book-isms.' The 'Said Book' is something popularized by James Blish. It was an entire book of synonyms for the word 'said.' It may have been something he just made up, I don't know. But it's true that in a lot of pulp fiction, there are a lot of adverbs attached to verbs meaning 'said.' 'Hello, she laughed furiously.' That's hard to do. 'Hello, she laughed' is even quite a neat trick to pull off. 'Hello.' Period. 'She laughed.' That makes sense.

"Then, there is Chip Delaney's concept of subjunctive tension to watch out for when you write. It's the tension between what your words say and the image they evoke in the reader's mind. In science fiction, that often presents unique problems. If you're writing a mainstream novel, your main characters can stand on a corner and you can say that 'he threw his eyes down the road.' People will read right over that and understand what you're saying. Say that in a science fiction novel and you have a pretty grotesque scene going. My favorite is 'he strained his eyes through the viewscreen.' Yccch."

Writer. Fan. Teacher. Vonda McIntyre copes with fame the same way she went about achieving it, with incredible fluidity and ease. When she's not instructing would-be writers on the tips of the trade, she spends most of her current time working on her next SF novel, a sequel to the short story "Aztecs." "This is another case of my getting more interested in characters than the original storyline," she explains. "This book is about one of the story's secondary characters. It keeps on getting longer and longer. I have no ideas about how it's going to end. I keep writing and writing and more and more interesting people keep popping up. Several of them really deserve books of their own."

Surrounded by recurring themes and unforgettable characters, the easy-going McIntyre shrugs her shoulders and smiles. "These days, I sort of feel like a literary Norman Lear. I have spin-off after spin-off coming out of my typewriter."

John Varley

(continued from page 25)

food and water, so a human can survive forever just taking in occasional ice and rock particles from the rings.

There's another factor in the Eight Worlds called the Ophiuchi [Off-ee-oo-kee] Hotline. The Ophiuchi Hotline is an interstellar telephone system, more or less, which is aimed several billion miles beyond the orbit of Pluto and appears to be coming from the star 70 Ophiuchi. A lot of information comes over it all the time. Humans discovered it when they sent a ship that far out and picked up this laser beam. They just started listening in and using a lot of this information and it shaped society in various ways.

People have been fascinated with the Ophiuchi Hotline idea. I was just thinking about how people have been listening for messages from space on and off since the late 1950s. I wondered if maybe we were listening from the wrong place. Maybe we couldn't hear from here. If they were broadcasting directly to us, would they send a message this close to the sun, where it might be garbled? And also, would they really have any interest in talking to us if we couldn't even get out into space to listen to a message? So if they sent it to way beyond Pluto's orbit, anybody who would pick it up out there would be a space-faring species capable of using the information they were sending.

The Eight Worlds appear to be crystal clear in your head. Do you consciously pay close attention to consistency? Is it difficult to keep your future straight?

I once made a long timeline and tried to put all my stories on it to see if they were consistent, and I think they were. But this hasn't been such a problem with the Eight Worlds as it might have been with a future history like Robert Heinlein's. His stories evolved from one to the next, starting essentially with the present day and building from there. My society is not really like that, except for the forming event of the Invasion.

In fact, the Eight Worlds society has stagnated quite a bit. There are two reasons for this stagnation. One is a sort of metaphysical reason that I won't try to defend, but I feel that if human beings were completely and easily kicked off the face of the Earth, it would be a blow to this feeling that human beings are sort of God's favorites, and can conquer anything and will expand forever. If that viewpoint were dead, I have a feeling that there would not be so much of this outward thrusting—not only in exploration, but in science, in areas of trying to find out new things and trying to change society. It's a very conservative society, it doesn't change much once it's reached this point. The only exception is the information that comes for free, with no research necessary, over the Ophiuchi Hotline. Every once in a while, something new is introduced from there. For instance, the techniques of memory recording and cloning to produce a sort of highly unsatisfactory immortality in

that, if a person dies, that person is actually dead, but a very good duplicate can be made—including memories up to the last recording. Things like that would change society a great deal, but it would be assimilated very fast and society would stabilize again. So the Ophiuchi Hotline is, in a sense, a stagnating force. Research is discouraged. The plot of the novel deals very much with someone who is trying to do some original research and gets in a lot of trouble for it. She gets executed several times.

The main characters of both your novels and of many of your short stories are female. Any particular reason you favor that viewpoint?

It was partly a conscious decision to have at least 50 percent of the protagonists in my stories be female, and it evolved from that. I don't have a whole lot of control over the stories I do, because they come in the form of inspirations. They usually come in the form of a picture I see of some sort of situation and a person in that situation. Then I make a story from the picture. It just began to be that a majority of those pictures were of a woman in a situation. I haven't had any objections to it.

In the Eight Worlds it's not such a big deal which sex a particular character happens to be at a particular time in a particular story, because it's implied that they have been both, and will be the other sex again. But even in the non-Eight Worlds stories, more often I've dealt with a female character. My first non-Eight Worlds novel, *Titan*, has a female ship's captain as protagonist.

Do you have a science background?

I'm not that strong on science and probably never will be. I just have a feeling for physics. I started out to major in physics in college, but it got to be too hard. What I began to learn about being a physicist—or an astronomer, my second choice—was not that attractive. I didn't want to do that kind of research. There's so much you have to learn before you can make any new discoveries in physics, it just lost its appeal. If I could research the kind of basic things that Isaac Newton researched, it might have been fun.

You have to have some understanding of science to create these future histories, but I don't think you have to be a scientist to write what's called "hard" science fiction. I've been complimented on some of the scientific things I put into my books, and sometimes I think I'm the only one who knows that I'm faking a lot of it. I make up things according to what I know about physics or biology, and what I think might someday be possible. I have postulated a whole lot of things that I have no idea whether they're even theoretically possible. But when you set a story far enough into the future, you can say something like it will be possible to have easily reversible and cheap sex changes, or instant clones. There's no point in trying to say how it would be done, because I haven't the vaguest idea. If it's 400 years from now, you just assume that they're going to know how to do a lot of things that we have no inkling of now. But if anybody thinks I know how to do these things, they're in for a big disappointment.

You manage to make things like instant clones believable and commonplace, just casual background stuff.

Detail is really necessary in science fiction futures. You have to have it—but be casual about it—or the story just doesn't ring true.

For instance, if you could change sex—something that would be totally startling to anybody living now in 1979—obviously it wouldn't be to somebody who'd grown up knowing that possibility is there. So what would their emotional reaction to something like that be? It boils down to the fact that it would be as simple and as common as something like making a telephone call is to us—which would have been startling to somebody from the year 1700. You have to think about the details until you're as blasé as the characters would be. You have to spend some time there.

I've been able to turn my insomnia into an advantage. It generally takes me about an hour to get to sleep, even on a good night, so I spend that time thinking about that future society and pretending I'm somebody in that society doing everyday things... or doing astonishing things. And it adds up. After several weeks, I'm able to write the story.

How do you envision the real future? Do you think it will resemble your future history in any way?

I definitely would be surprised to see any of the things postulated for the Eight Worlds happen in my lifetime. But if human beings stick around for a thousand years and keep learning things about science, I would think it's likely they'll be able to do anything I've postulated. You have to figure that no matter how good your imagination is, it's going to fail when you get beyond 50 years in the future. Because things are going to happen that we have no way of perceiving, much stranger than anything you can imagine today.

Thinking about the real future, I'm basically not very optimistic about a lot of things. I retain some hope that something good will happen, but I can't be very optimistic about a society that has the number of atomic weapons stashed away that we do. I feel it's inevitable that they'll be used. I do believe that human society will survive it, but it's not going to be a very pleasant existence. I see the future as pretty unpleasant... and I suspect that people from 100 years ago would think our society is pretty much of a mess.

I'd love to see space exploration speeded up. I don't have a lot of agreement with the people who say we ought to solve our problems here on Earth before we go to space, because I don't believe all our problems on Earth are ever going to be solved, whether we go to space or not. On the other hand, I don't agree with the idea that going out into space implies we're abandoning this planet. I hope we can do both. We can do our best to save this planet, which we're doing our best to ruin right now, but there is the possibility of some solutions to some of our problems being found in space. If we could find more resources of various kinds, especially minerals, we wouldn't have to strip mine this planet to get them. ▮

PORTFOLIO

JOHN BERKEY

The Minnesota artist is nearly as elusive as the mysteriously convincing spaceships he paints.

By ROBIN SNELSON

John Berkey—the top illustrator whose impressionistic spacescapes have made him famous among space art admirers—is not an easy interview. He keeps insisting that he's not a very interesting person, and basically not very outgoing either. He doesn't have much to say about his ethereal spaceships, except that they are generally more fun than some of the other things he paints—historical scenes, landscapes, disaster movie posters. He would have you believe he's just a guy who paints for a living and lives happily in the quiet Minnesota town of Excelsior, surrounded by trees and overlooking a clear lake. He lives with his wife, Demi, and four children, ages 15, 19, 20 and 21, and is pleased to report that his two oldest sons are working toward being artists. From the basement studio in his home where he works, 44-year-old Berkey likes to watch the ducks fly over Christmas Lake and announces their appearance to telephone callers.

He verbally tap dances away from specific questions about himself, asking you questions about *yourself*, then answering yours when you don't expect it. Well into a phone interview, he tells you that he's taping your conversation, too, then wonders if you have anything on tape yet you can use.

He is nearly as elusive as the mysterious (yet somehow substantive) spacecraft he creates on canvas. But he is not uninteresting.

John Berkey has always known what he wanted to do. In high school he started painting and worked part-time in a studio. After high school, he spent a productive three months in a Minneapolis art school, then



went to work in a commercial studio. Fourteen years ago, he moved his base of operations to his home, where he works today.

He favors a large canvas, mixes his own paints and is partial to light, swift brushstrokes. And he works with mirrors.

Suspended over the desk where he paints is a large mirror, tilted at an angle and reflecting into another mirror in front of his desk. Behind him a third mirror shows the image in reverse. "That's the only way I can see the paintings while I'm working on them," he explains. "I'm painting something that I have never seen, and that way I can see it quickly and in the abstract. My wife says I use the mirrors more than the painting. I look at the mirrors and paint."

What makes the space paintings (like those featured here) more fun for him is the freedom they afford. "I don't have the restric-

tions I would on something like a historical painting. There's a lot of pleasure in designing shapes and painting things that are your own. With most other things, you're duplicating something that already exists—at least in somebody's mind."

When he paints on assignment, it usually involves doing something that can't be photographed, for whatever reason. He intentionally reserves about one-third of his working time for painting for himself ("or practice"), and that's usually spent doing figures—something he's not widely known for, but which he does very well. Berkey thinks it's important to keep painting just for himself. "I know a lot of artists who just do their work and that's it. In my own mind, that is kind of a dead end. Without working for yourself, there just isn't any way to see what the questions are. Because on any job, you're putting down answers you already know. On your own, you find new questions."

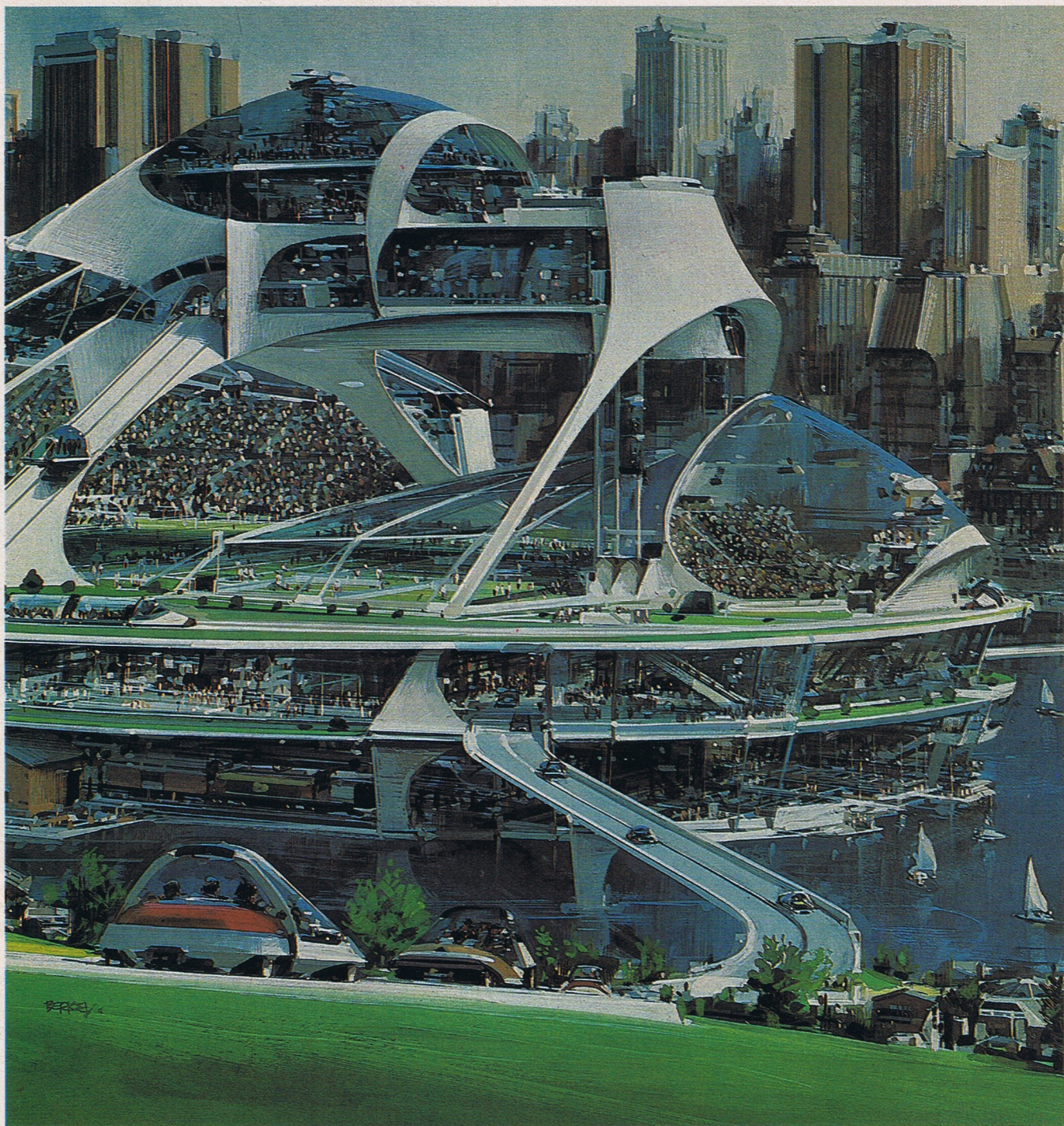
Berkey's versatility and range have made his art much in demand from a variety of clients. For years he's produced pastoral landscapes for a series issued by the Minnesota firm of Brown and Bigelow. He paints historical scenes for Texaco calendars, and does advertising art—the most memorable being a series of futuristic cityscapes done for Otis Elevator Company. Lately he finds himself doing more and more poster art for motion pictures.

"The way that works," he explains of the film assignments, "is that I can work on it,

The editors wish to thank John Berkey's New York agents, Frank and Jeff Lavaty, for their kind assistance in assembling this portfolio.



BERKEY



ART © 1979 JOHN BERKEY

Above: One of a series of paintings Berkey did for the Otis Elevator Company's "The Future Is..." ads. This is an entertainment complex/marina based on Berkey's architectural imagination. Opposite page: A classic Berkey spaceship for the Portal Poster series.

but the painting won't always be used." Some of his paintings that have been used in movie ad campaigns are *King Kong*, *Towering Inferno*, *Orca* and *Airport '79*.

Berkey says he enjoys doing film poster art, although he finds it restrictive, "in that you're doing something that there's already an image of, and you're trying to duplicate it." He works out concepts in phone conversations with his New York agents, Frank and Jeff Lavaty. Somehow, it's hard to believe that all he does is duplicate pre-determined images.

But when it comes to the patented Berkey spaceships, increasingly in demand by both science fiction publishers and commercial

advertising clients, Berkey is at his best. The spaceships are his own images, nearly abstract—and successful artworks as abstracts. On other levels, his sketchily detailed space yachts are masterpieces of science fiction imagining, products of some alien or futuristic technologies, mysteriously convincing.

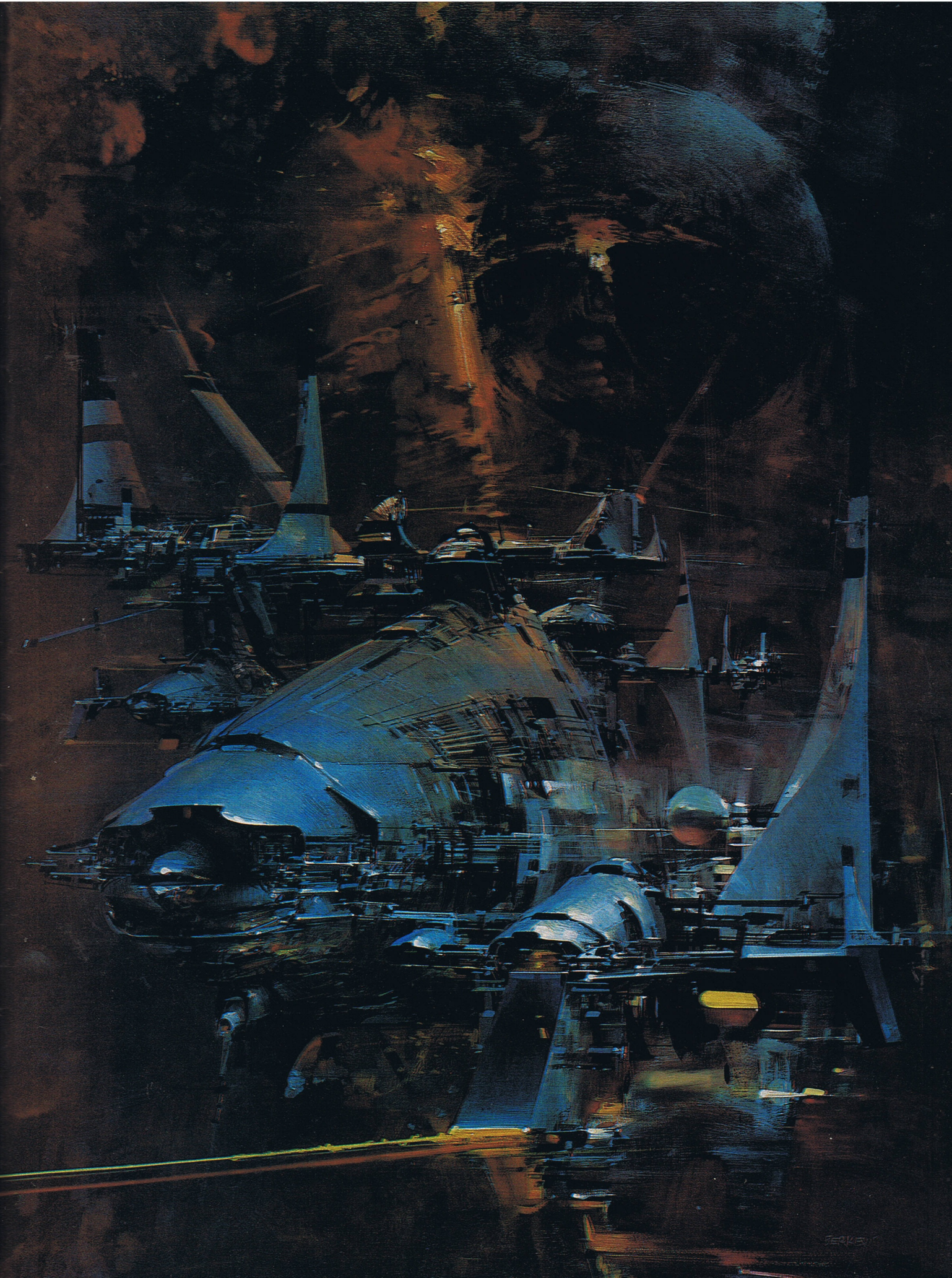
Berkey doesn't like to furnish too many details about what's happening in his spacescapes because he doesn't want to limit the viewer's imagination. "I like for people to be able to see whatever they want to see." When pressed for descriptions of a painting's story, he'll offer a half-hearted fiction about spaceships powered by esoteric energy sources. Like what? "I have no idea," he says

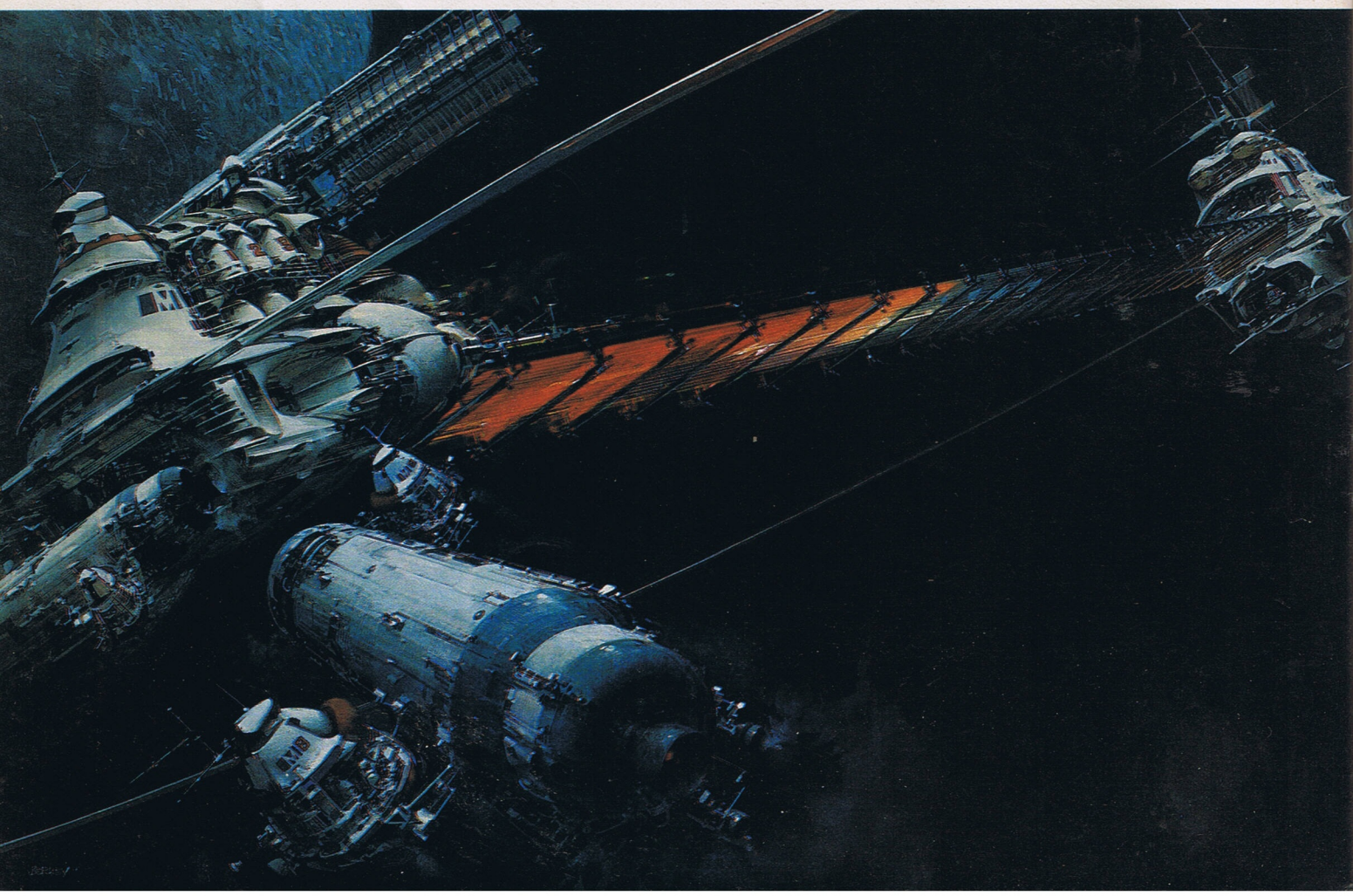
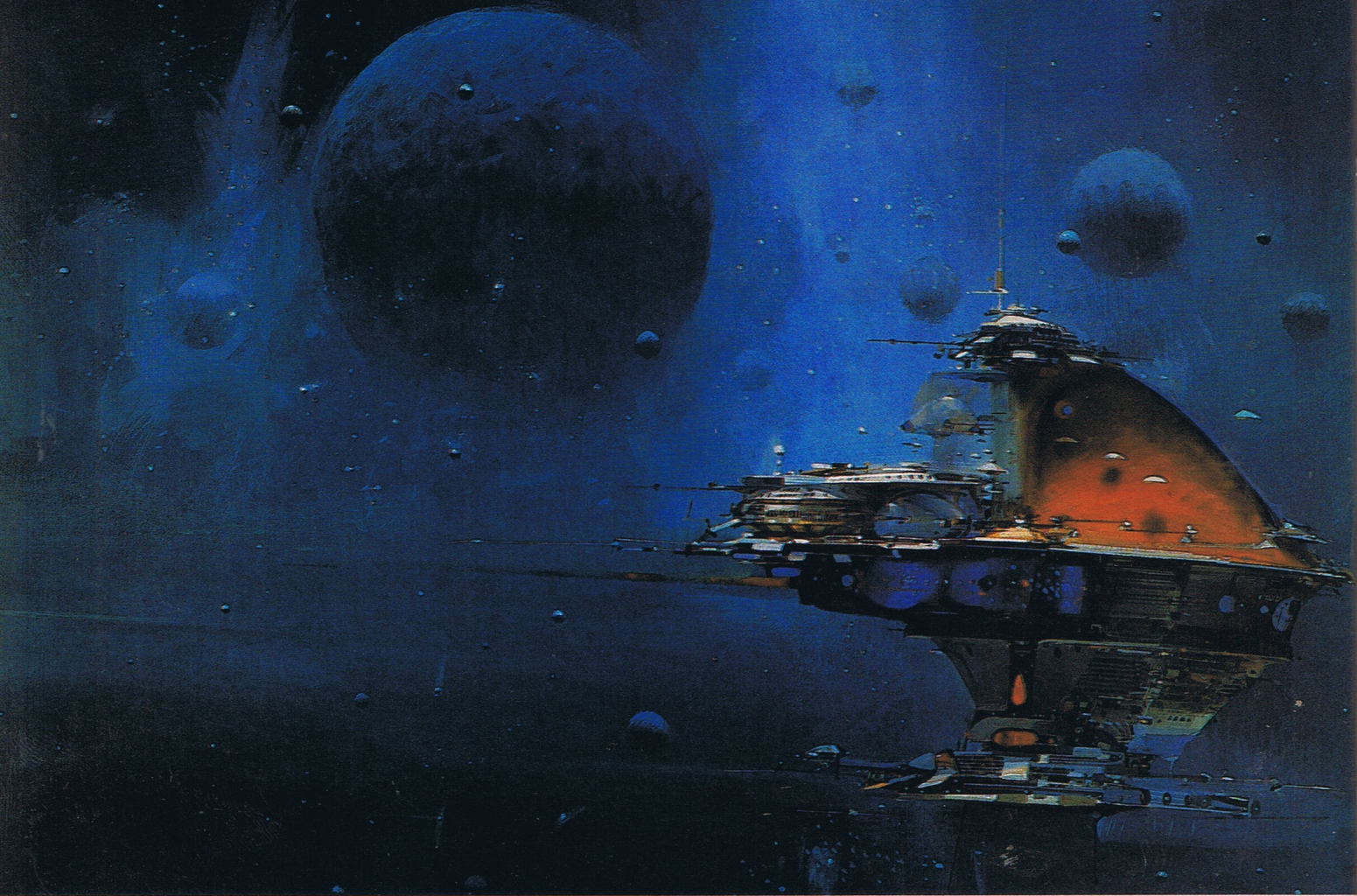
immediately. "When you paint that kind of thing, you try to deal with what we know today as a shape that will move fast. But as far as being technically accurate... who knows?"

Despite the impression one might get from his majestic spacescapes, Berkey is not exactly of the science fiction persuasion. "I have a curiosity about space and the future," he says, "but I don't live there. I've read some books on the technical part of the future, and that's always interesting, but as it weaves off into fiction... I think you can let your mind go to the point where that kind of thing can become real. That's kind of scary to me."

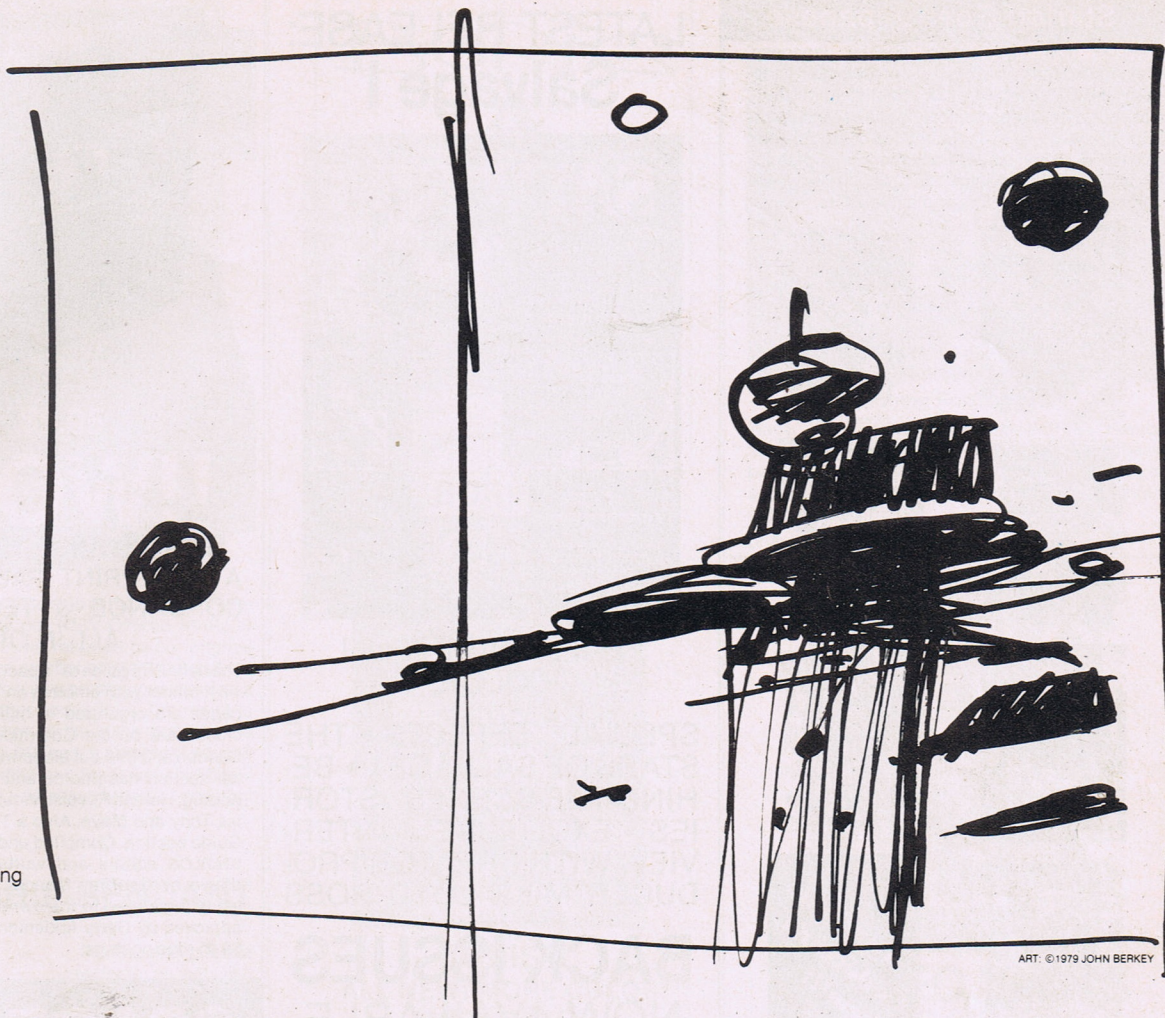
But when he's painting for himself, his im-

ART © 1979 JOHN BERKEY





Left, above: Cover painting for Avon book, *Interstellar Travel*. Right: The preliminary sketch on which Berkey based the *Interstellar Travel* cover painting. Left, below: Ad artwork done for a company advertising "space-dyed yarn technology."



agination does sometimes turn toward the extraterrestrial. Recently he's been experimenting with a new kind of spacecraft. "We always think of spaceships being metal, or somebody from a distant planet coming here in a saucer-shaped metal object... I don't know why they couldn't be alive and breathing rather than metal tubes and pipes and so on. So that's what I've been doing for myself lately." He pauses, looking at a mammoth organic spacefarer, invisible and unimaginable to his telephone caller. "They're kind of pretty," he reports, as if he's just discovered their appeal. "Some are paisley with big stomachs. They would go slower than the others."

Images from nature count for much of Berkey's inspiration. He once painted a futuristic airport terminal for the Otis Elevator series that looked, to him, like a giant duck sitting on an egg. He thought it was amusing that nobody noticed. The crisp reality of his painting perceived by viewers mystifies him just a little. He tells a story about another skyscraper he painted for Otis. A Texas builder wrote to Otis asking for the imaginary building's blueprints. That strikes him as funny.

His nonchalance about rationalizing the underlying technology of his paintings somehow translates into inexplicably believable futuristic creations. Perhaps it is their vibrating, not-quite-defined quality that

makes his spaceships so comfortable in their cosmic settings. Would he want to board one of his elegant spacecraft for an off-planet excursion? He takes a deep breath, then replies, "If I was damn sure I could get back!"

In addition to his visual artistry, John Berkey has another creative passion: sounds. His studio, where he spends 16 or 17 hours a day ("not all working"), is outfitted with an elaborate sound system, including 22 speakers positioned around the room. "I like electronic music," he says. "Klaus Schulze. Brian Eno, when he doesn't get too many guitars in there. John Cage when he's not too monotonous. If you can imagine Eno's *Music for Airports* coming out of 22 speakers... the sound is gigantic," he reports with relish.

"I love music, but more than music, I love sounds. I always put sounds together with other music." He builds boxes to conceal a stereo tape recorder, and tapes outdoor sounds. "I taped an hour of a meadowlark, the other day. Lately, I've just been going out with the tape recorder. I taped about an hour in a department store at closing time, when no one was moving around too much, just echoing... I put that together with some electronic music and it worked real well."

He listens to his originally engineered concerts nearly every night, but he doesn't listen while he works. "I can paint and not have any of my emotions come through," he says,

"but it's absolutely impossible to make a tape and have it sound any different than just exactly how I'm feeling at the time. That's why I think it would be too distracting to listen while I paint."

Although he's slightly resistant to interviewing and truthfully not a very extroverted person, Berkey is a fascinating creative personality, and it's always interesting to know a little more about the artist behind the visions. After nearly an hour's conversation (with the interviewer answering a disproportionate share of the interviewee's questions), the tape machine was finally shut off and John Berkey sighed with relief... and began to talk...

The following week he sent two prints of his landscape paintings, along with a note: "I used part of our conversation on a tape I'm working on. Our talking has a background—a neighbor cutting down a tree and some children in Excelsior playing a game (the sounds being mostly the yelling involved in each one's understanding of the game)."

At night, he turns out the lights and listens to the textured interweavings of his aural creations. And during the day he sits in his quiet Minnesota studio, looks at the mirror and paints his exotic spaceships. His goals for the future? "I don't think I'll ever lose my curiosity about painting. I've never done a painting I've been totally satisfied with. That's a goal. But I don't think I'll ever get there. There's always a long way to go." ▢

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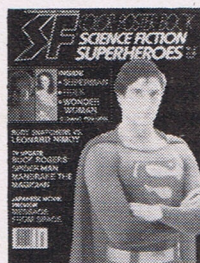
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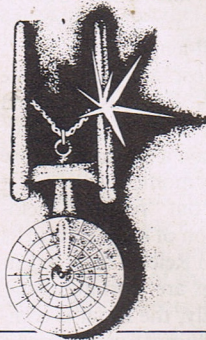
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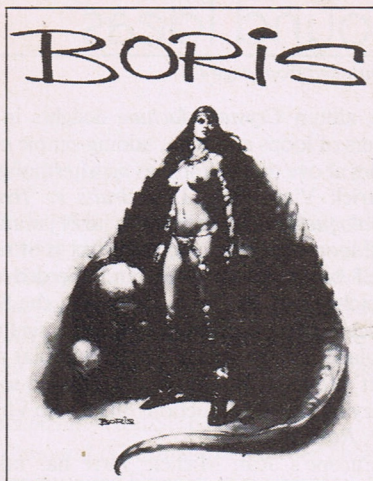


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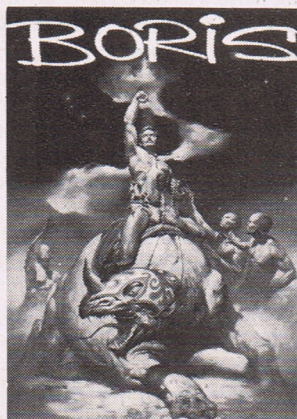
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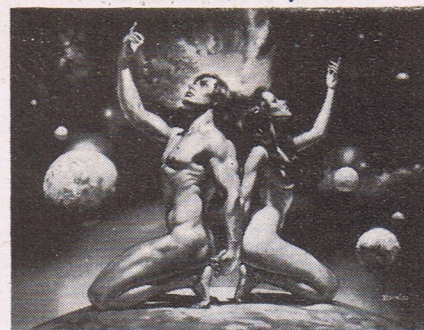
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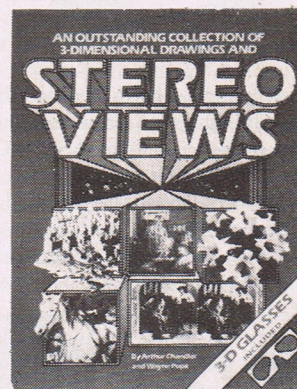
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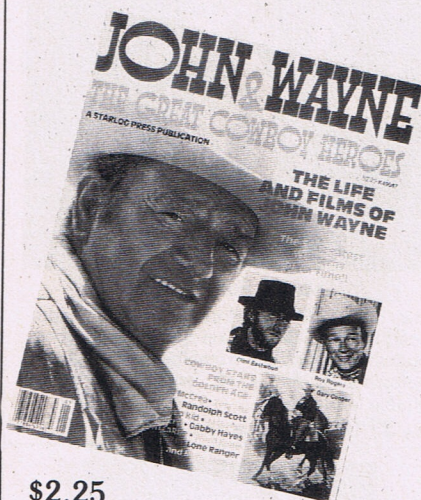
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Sound Ideas

(continued from page 47)

His album *Crystal Machine* delights in its layers of loops and echo, adding simple melodies above them almost as an afterthought. Patrick Vian's Egg LP, *Bruits et Temps Analogues*, vacillates between jazzy jamming and loop constructions; the effect is of time itself being slowed down and speeded up, stretched out and bent. In Britain, the Soft Machine were fascinated by loop music (particularly on *IV*, released by Columbia) and Soft's founder Robert Wyatt included some dizzying loop constructions on his solo Virgin LP, *Rock Bottom*.

Europe's Jean Michele Jarre has taken synthesized sound to quite popular ends via such long players as *Oxygene* (Polydor), and England's Mike Oldfield (Island) popularized repetitive composition via LPs like *Tubular Bells* and *Hertsfield Ridge*. Teutonic Can (United Artists) has been recording spaced-out rock epics for years, although very few of them have seen stateside release. RCA's Tomita gave an electronic update to Holst's *The Planets*.

Other European acts to dabble with futuristic free-form sound include Amon Duul II, a Munich-formed band (*Vive La Trance*: United Artists); Brian Auger, an avant garde keyboardist-rockbuff (*Second Wind*, *Oblivion Express*: RCA); Genesis (*Foxtrot*: Chrysalis, *A Trick of the Tail*: Atlantic); Gong, an avant garde band of British-Parisian origins (*Angel's Egg*, *Shamel*: Virgin); Hatfield of the North, a free-form rock/jazz quartet of British roots (*The Rotters Club*: Virgin); Henry Cow, a near obscure United Nations of experimental musicians headquartered in England (*Unrest*, *Desperate Straights*, *In Praise of Learning*: Virgin); If (*If I*: Capitol); Isotope, a British jazz-fusion quartet; King Crimson (*Red*, *USA*: Atlantic); Faust, a German band; Jack Nitzsche (*St. Giles Cripplelegat*: Warners); P.F.M., an Italian art-rock ensemble (*Photos of Ghosts*: Manticore); and Van Der Graaf Generator, Peter Hammill's British experimental outfit (*Aerosol Grey Machine*: Mercury, *H To He Who Am The Only One*: Dunhill).

The American bands most receptive to synthesized sound have, thus far, been jazz-oriented. Some of keyboardist Herbie Hancock's finest, spookiest music was recorded with synthesist Dr. Patrick Gleeson in the band on *Sextant* (Columbia) and *Crossings* (Warners). Weather Report's Josef Zawinul dabbles in loops on *Mr. Gone* (Columbia) among his many experiments in synthetic sound. Meanwhile, in upstate New York, a trio called Mother Mallard's Portable Masterpiece Co. puts out their own LPs (on Earthquack Records, P.O. Box 842, Ithaca, NY 14850) of trance music that is somehow pastoral despite its synthesized origins.

At present, one of the best-known synthesizer composers in rock is Brian Eno. An early member of Roxy Music, Eno has since produced Talking Heads, Ultravox and Devo as well as his own solo LPs. Eno works with a

number of different "strategies," one of the most interesting of which is the idea of "virtual music": music that deflects rather than encourages attention. On *Music for Films* (Antilles), *Discreet Music* (Obscure) and parts of *Before and After Science* (Island), Eno creates subtly benevolent music that slips into the ambience unless you listen carefully. Despite its low-keyed musical stance, it is thoroughly thought out and rich in implications. Robert Fripp, founder-member of the British band King Crimson, joined Eno for an excellent collaborative effort, *No Pussyfooting*, unsurpassed for its experimental daring. The beauty of Eno's approach is that he also includes acoustic instruments and voice in his musical masterplans.

Eno traces some of his strategies back to contemporary classical composers so it is only fitting that loop music comes full circle, spotlighting some of the acknowledged "masters." Some unquestioned masterpieces of trance sound are found in the classical realm: Riley's pieces, Karlheinz Stockhausen's *Stimmung* (on DG), Morton Subotnick's suspenseful *Sidewinder*. Two classical composers, Steve Reich and Philip Glass, have brought the art of repetition into a post-synthetic era. Having experimented with electronics, they've decided that they prefer to write for human beings. Glass scores for soprano voice accompanied by electric organs, saxes and flutes; always juggling the repetition and sudden texture changes to the utmost dramatic effect. *North Star* (Virgin) is an album of short selections. *Einstein on the Beach* (Tomato) is a full-length opera.

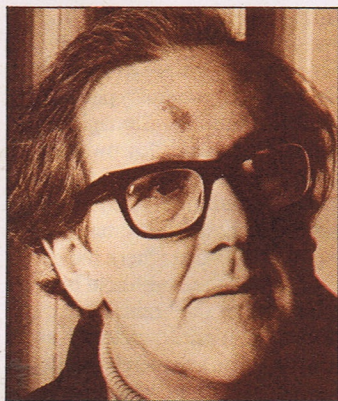
Reich is one of the most humanistic of the trance music composers. His music is based on the interaction of a series of phase patterns; what happens when a repeated phrase interacts with itself a few moments later. As it turns out, the ear picks out "resultant melodies" from the interaction of a phrase and its ghosts. And when, as in Reich's most recent music, multiple patterns are working themselves out simultaneously, the result is complex and involving, producing surprises upon each subsequent hearing.

Reich writes for doubles and multiples of instruments. His pieces include *Six Pianos*, *Violin Phase* for violin and three taped violins and *Clapping Music* for two musicians. Lately, he has expanded his ensemble to 18 musicians, including marimbas, woodwinds, piccolos and voices. *Drumming* (Deutsche Gramophon) is a comprehensive set of Reich's music, including *Six Pianos* and the extended title suite. *Music for 18 Musicians* (ECM) is his latest recorded composition; a rich, multi-textured piece built entirely on phase patterns. It is meditative yet full of activity, and it would be as comprehensible to a Balinese native as to a New Yorker.

Reich has done a lot of thinking about the music of the future. His conclusions are very encouraging. Perhaps Reich is speaking for all the futuristically minded composers, both electronically and acoustically oriented, when he says, "Obviously, music should put all within its listening range into a state of ecstasy."

Future music sounds like fun.





By BRIAN W. ALDISS

Brian Aldiss claims to have the "sort of fertile mind that is the enemy of endeavor." Despite his alleged mental meanderings, Britain's Aldiss has proven himself to be one of that country's most prolific science fiction writers during his two-and-a-half decade career. He received a Hugo in 1962 for his book *Hothouse* and a Nebula Award in 1965 for *The Saliva Tree*. Other books by Aldiss include *Non-Stop*, *Cryptozoic*, *Frankenstein Unbound*, *The Shape of Further Things*, *The Malacia Tapestry* and *Enemies of the System*. He is currently at work on a sprawling science fiction novel written in the "Stapledonian tradition."

In Search of the Whole Man

Back in the nineteen thirties, there was a scientific prophet who went by the name of Professor A. M. Low. He wrote several books and a host of newspaper articles about the future, often showing a considerable gift for aphorism. (One example, on diet: "The stomach will take countless centuries to die.")

It was Professor Low who said, "It is the accident of time that prevented Anthony flying to meet Cleopatra."

It's a resounding remark, which probably finds a billet in the heart of every science fiction reader. We don't like accepting things as they are. We would probably reply to the professor that it is an accident of time which prevents all of us from flying to meet Cleopatra. Everything is relative.

The accident of time which teases me most is the question of the human personality, its limits and its extents. Is personality changing? Are we becoming different, generation by generation? Are we becoming supermen, or mere adjuncts of the machine?

Personality is a simple enough phenomenon. Every human being has a personality, though in some it is decidedly more noticeable than others. We have yet to devise a machine which measures degrees of personality, because the matter is subjective, but we are all aware of personalities and how they differ. President Carter's differs from ex-President Nixon's, Leonard Nimoy's differs from Rod Stewart's, Christ's differs from L. Ron Hubbard's, Laurel's differs from Hardy's. We have no precise form of words in which these differences can be expressed, except in terms of function: Laurel gets hit more than Hardy, and so on.

Occasionally, magazines run adverts which say "Improve Your Personality." It sounds silly. We know there are possibilities for improving our incomes; but personalities? Well, it can be done, but obviously only within limits. Occasionally, the penal system actually reforms people—and perhaps it does that as often as it degrades them. The will to reform

has to be there. And where does the will live but in the mind? The mind is a useful term meaning seat of consciousness, residing in the body as well as the brain.

It sounds immodest to admit to such things, but I believe that I have slightly improved my personality of recent years. As my friends would say, there has been room for improvement. I have at least the illusion of improvement, which I owe to yoga.

I am no doctrinaire follower of yoga. I prefer doing it in a class with others to practicing on my own. Team spirit helps. The various postures unite brain and body in a mysterious way. Breathing seems to be the key; after some practice, the various sorts of yogic breathing actually take over part of the role of consciousness. Thought subsides. Recently, I have achieved brief spells of meditation.

It is amazing not to have the constant bustle and traffic of thought—often unwished—in the brain. It feels extremely good. One can slowly learn to extend the brain-body unity into other periods of the day. An oceanic calm arises. Thus, behavior initiated by the organism causes changes in the organization of the nervous system, which results in a restructuring, or at least a modification, of the personality.

Which leads me to a consideration of the human brain, that amazing little machine which, like an outboard motor, has propelled us across the oceans of the centuries, from the trees to masters of the planet. A great evolutionary gimmick, the brain, which has done much for the species to which we belong. How well does it serve the individual?

Speaking frankly, I've always found my brain a bit quirky. Maybe it does not fit quite correctly. Maybe the connections are not all they should be. Maybe dreams indicate fault lines. Maybe we all suffer from a lack of sufficient integration between this amazing overgrown organ and the rest of our anatomy, which we have in common with the animals. This theory is developed with force by Arthur Koestler in his book, *The Ghost in the*

Machine. When sensible people lose their tempers and do something stupid, then the integrative connections reveal their faults, and the purely instinctual overrides the intellectual. Or, to put it another way, the Heart overrides the Head. Since to talk of the Heart at odds with the Head is to talk metaphorically, I am later going to alter the metaphor and talk of the Self at odds with the Ego.

There are various ways of interpreting the history of mankind. The most commonly received view is that it has been pretty steady upward progress since the Neolithic times, give or take a few wars—but even wars speed up technology and therefore indirectly hasten the march of progress. This view is by no means universally held. History may be merely cyclic. Definitions of civilization vary; if to be superbly well integrated with one's environment is to be civilized, then the South American Indians in the rapidly disappearing depths of the Amazon are the most civilized people on the planet. Or is the extent to which we are civilized gauged by the extent to which we exploit our environment?

What we are unfortunately unable to do is point to any particular indication of the upward evolution of our species in historic terms; the period has been too short for that. There have been tremendous social evolutions and scientific revolutions, but they spring from the invention of literacy and are not biological. These changes have all emphasized the division between the Head and the Heart.

The division has always been there; it is as old as human consciousness. As far as we know, we are the only species with consciousness. Of the period during which humanity came into consciousness, became human, we know little; we can visualize a time when dance, chant, ritual, were all-important. Consciousness was developing. But beneath our conscious lives, a vivid subconscious life still continues, and does not manifest itself in dreams alone.

This is what Plato means when he points out, in *The Republic*, that "Even in good men, there is a lawless wild beast nature, which peers out in sleep." We fear the power of the subconscious, but it is to be feared only if we are on bad terms with it. Lewis Mumford says, "Creativity begins in the unconscious; and its first human manifestation is in the dream." We are all of us refreshed throughout our lives by the organic exuberance of dreams. States of meditation can give us something of that exuberance.

I use the terms unconscious, subconscious, Heart, rather carelessly and interchangeably because none of them define accurately the elaborate parts of our being which are beyond consciousness. They are beyond consciousness but they are within our anatomy.

Physiologists divide the human nervous system into two parts, the central and the autonomic nervous systems (the autonomic

nervous system is itself subdivided). The central nervous system is controlled by the part of the brain known as the cerebrum—the conscious part of the brain, which is divided into two cerebral hemispheres. It may be that the autonomic nervous system controls the automatic or semi-automatic functions of the body, such as heart-rate, breathing, sweating, reflex movements of muscle, and so on.

The scientist and philosopher, Stan Gooch, has put forth the theory that the cerebellum controls the autonomic nervous system and is the seat of the 'subconscious,' the physical site of what Freud and his followers call the unconscious mind. In his book, *The Paranormal* (published in 1978), Gooch enlarges on this fascinating subject, and particularly on the nature of the cerebellum.

The cerebellum is seated at the rear of the brain, with the cerebrum arching over it. It looks much smaller than the cerebrum, although it is two-thirds as large, to go by surface area, owing to its intricate folding and fissuring. Like the cerebrum, it also is divided into two hemispheres. In evolutionary terms, it is much older than the neoteric cerebrum, and as complex. It, with its ancillaries, is sometimes referred to as the limbic system; it is present in mammals, whereas the cerebrum and neocortex is mankind's unique outboard motor.

Words are the fuel of the outboard motor. The old brain uses images. The difference is like that between petroleum and logs.

At a certain period in evolution, the development of the cerebellum in human stock was overshadowed by the rapid development of the new brain, the cerebrum. Almost literally overshadowed. The old brain was slowly pushed back and below the spreading mushroom of the cerebrum.

Gooch uses a ghastly image to depict the roles these two parts of the brain play in relationship to one another. He talks about SF horror films where a dwarf or hunchback assists the mad scientist in his experiments. The humbleness of the hunchback, who gets no wages and feeds on scraps, is contrasted with the hubris of the mad scientist. When I first read this I was staggered, because the somewhat comic picture echoes my snap definition of SF as "hubris overtaken by nemesis," which is of course what always happens to mad scientists. The hunchback is the cerebellum, the scientist the cerebrum.

At least we see from this caricature that both sides are in league, yet also somewhat in conflict. Together they become the complexity of the brain. Often moving from physiology to other disciplines in his quest for understanding, Stan Gooch speaks of the imaginative ways in which the cerebellum brings itself to our waking attention, often by hints:

"The moon (in magic and legend) is the cerebellum, because it is old and pitted and shines with less light than the sun (which, in symbolic terms, is the cerebrum). The moon shines by night, as does the cerebellum..."

The dwarf, again, is the cerebellum because he labors underground. He is smaller than a real person, as the cerebellum is smaller than the cerebrum. Fairy gold and fairy light (the consciousness of the cerebellum) vanish in the harsh glare of day (the consciousness of the cerebrum)... Labyrinths are underground and in darkness because the cerebellum is also underground, buried beneath the cerebrum. The cerebellum is the Atlantis of the nervous system (and Atlantis is itself a further symbol of it)..."

"The Atlantis of the nervous system..." Not being a brain specialist, I have no way of determining which among rival theories are correct. Gooch's theories are interesting and imaginative, and therefore stimulating for SF readers. They serve also to concentrate our minds on the vexed problem of the Head and the Heart in an age when we are superbly able to solve many technological problems, yet are confronted by ever-growing human problems.

It is interesting to see what science fiction has made of these complementary and rival parts of the human personality. Once upon a time, future man was depicted as all cranial development, with a dramatic withering of the body (hence, perhaps, Professor Low's "The stomach will take countless centuries to die"). This is clearly a projection of cerebral growth at the expense of the autonomic nervous system. That's what happened to H. G. Wells' Martians.

Since then, science fiction has become more sophisticated, and concepts have been refined in the hands of several generations of authors. Now we frequently meet with clones, bionic men and women, androids, robots, computers, and all sorts of semi-autonomous machines. These represent steps along the way to de-humanization, with human kind shading off into machines. All these somewhat archetypal personages are projections of the Ego.

Interestingly, they got a better press than the old cranial man used to. He was a figure of loathing, a warning to us to do our physical jerks regularly. Robots, bionic men, computers, are nowadays pretty well received, or at least taken for granted. They are all creatures in which the cerebellum has been completely subjugated. There is plainly a will to believe in such metal projections, or at least to place them as if they belonged to some realizable future. Yet a moment's reflection assures us that robots which think are as unlikely as Frankenstein's monster. Thought is a property of the organic, not of the inorganic. Robots are men with the autonomic nervous system ripped out. They are all Ego. They lack Self.

Here is the genuine SF nightmare. That on some subconscious level, many important SF writers expect the future to be a monstrous affair where Ego, the ghost in the cerebrum, has triumphed. Where the Whole Man has no chance.

The Whole Man is a balance between Ego

and Self. Self on its own is as bad as Ego on its own, a little twittering mousey thing forever making impossible deals with God. Only with the binary system of Ego and Self in conjunction can the sun shine in human personality.

Perhaps all the entities we imagine 'outside' ourselves, from God downwards, are merely outside the focal length of the clever old cerebrum's cognizance. Perhaps God himself, and all the myriads of human gods, is just a creaking floorboard where the evolutionary join shows on the threshold between hind and fore parts of the brain. Perhaps all the non-physical entities, down to the aliens beloved of us writers, are merely echoes of conversations, held in the new brain, heard in the old.

If the Ego side of the brain triumphs, then we may have the sort of situation I envisioned in a recent novel, *Enemies of the System*, with the triumph of *homo uniformis*, Man Alike Throughout.

However, there are encouraging signs that the neocortex, the seat of the Ego, is smart enough to understand how necessary is its dark partner, Self. The mad scientist needs the hunchback, as Don Quixote needs Sancho Panza. The most encouraging sign is the way in which the West seeks the East in religious ideas, and the East the West in scientific ones. Inter-dependence is acknowledged. Also encouraging is the way in which scientists no longer refuse to have anything to do with mysticism or whatever smacks of the supernatural. Any movement which demolishes barriers between opposites is to be encouraged.

In that respect, the Apollo program has had a spin-off which goes far beyond technology. For many of the men who went to the Moon, men whose experience with machines was closer than anyone's, before or since, came through into an area akin to mysticism, where Ego and Self meet.

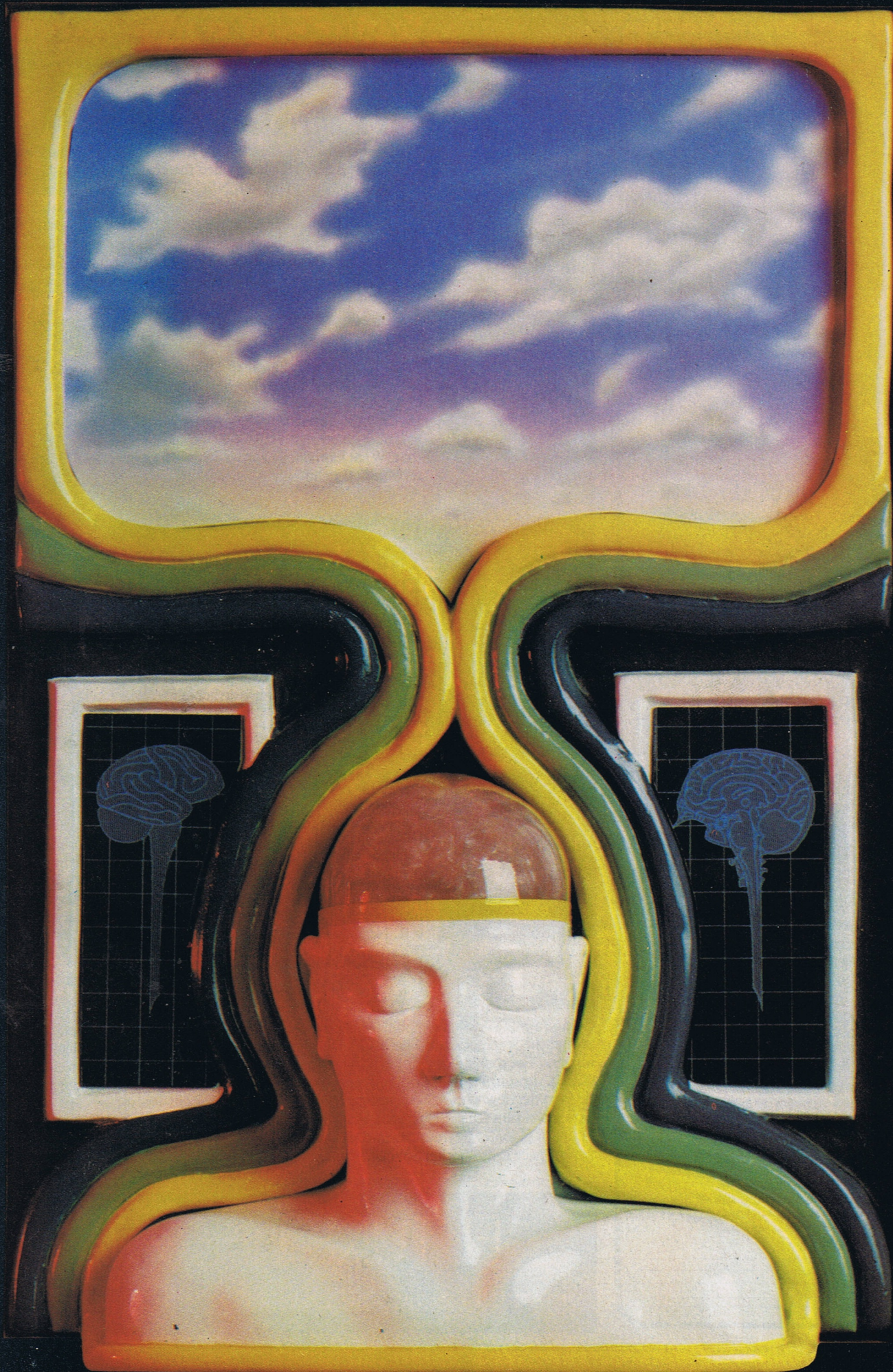
Although they have walked where we cannot go, their example may be followed. They point the way towards Wholeness.

The concept of a Whole Man in the future is nothing new. On the contrary, it has existed for thousands of years. That is only to say that both sides of the brain have dreamed of it, and long to experience it. Indeed, many individuals have achieved it. Far from banishing personality, Wholeness enriches it.

The trick is to convince more of the human race that Wholeness feels so damned good. It does not require aid from God. The creak of the floorboard is the distraction. The balance between the two parts is difficult, like all balances, but it can be achieved.

Its achievement—particularly if men of power achieve it—but they are generally too tense to let go—would lead to the end of war, and the end of acquisitive habits on a personal and national level. It would change the world and alter the future.

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THE MARTIAN CHRONICLES

For two and a half decades, the magic of Ray Bradbury's *The Martian Chronicles* has eluded the creative grasp of Hollywood filmmakers. This fall, NBC-TV will present the most ambitious science fiction production ever attempted: a six-hour, three-part version of Bradbury's classic book. Next issue, FUTURE LIFE visits video's Martian landscape for a first hand look at the challenges involved in bringing the future to TV.



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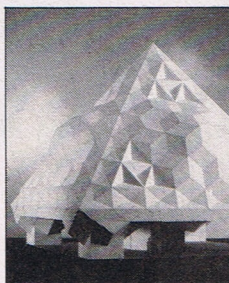
MARS IN '88!

During an era of skimpy space budgets, a fallen Skylab and delayed first launchings of the new U.S. space shuttle, talking about manned expeditions to Mars seems almost blasphemous. In reality, just 10 years ago, this nation was making a commitment to landing men on the Red Planet... and by the early 1980s at that. What happened to the man-on-Mars program? Can it be salvaged? Can humans really make Mars by '88?



THE FATHER OF DUNE

Back in the 1960s, Frank Herbert wrote a science fiction novel entitled *Dune*. Shortly after its publication, the book achieved cult status and hundreds of thousands of mainstream readers entered the sandswept worlds of *Dune*, *The Children of Dune* and *Dune Messiah*. In this exclusive interview, author Herbert reveals the secret behind his successful writing career and talks about Dino DeLaurentiis' forthcoming *Dune* movie.



THE WORLD OF LASERIUM

Meet Ivan Dryer, the young founder and president of a company called Laser Images. Laser Images specializes in a whole new field of entertainment... a phantasmagoric laser show wherein art and technology overlap. Dryer is the driving force behind *Laserium*, a multi-media presentation which combines contemporary rock with futuristic laserlight, and is shown at planetariums coast-to-coast and sells out tickets like a rock concert. Next issue: *Laserium*'s colorful wonderworld.

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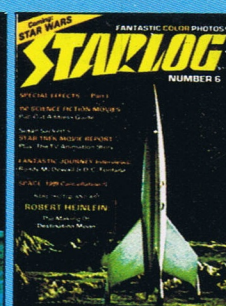
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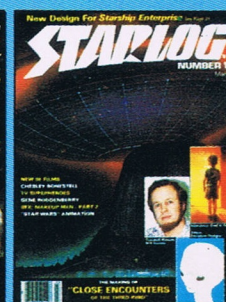
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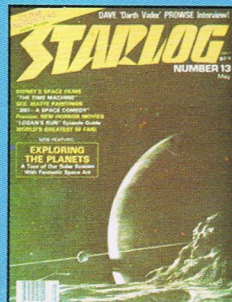
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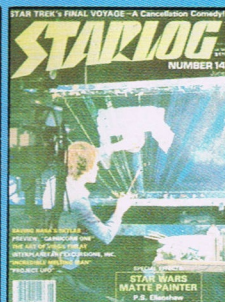
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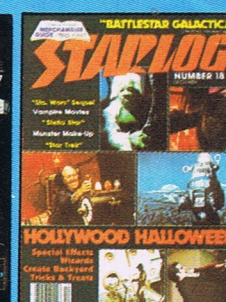
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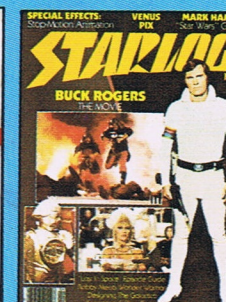
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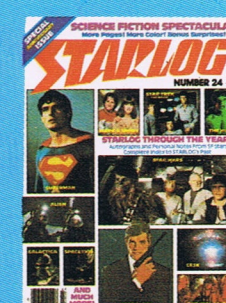
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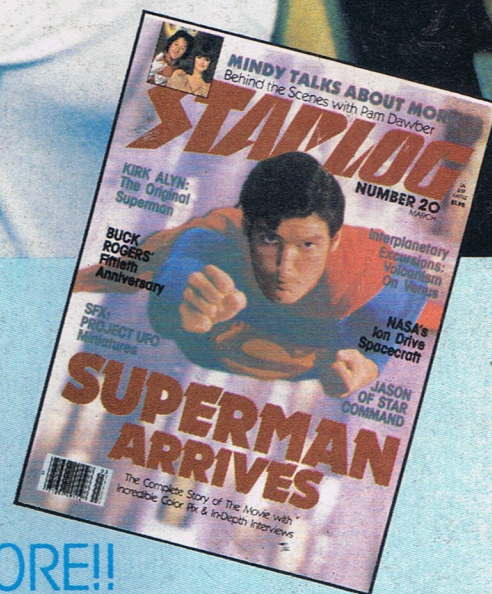
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